HOLOCENE GEOARCHAEOLOGY AND PREHISTORY OF THE RAY ROBERTS LAKE AREA, NORTH CENTRAL TEXAS

by

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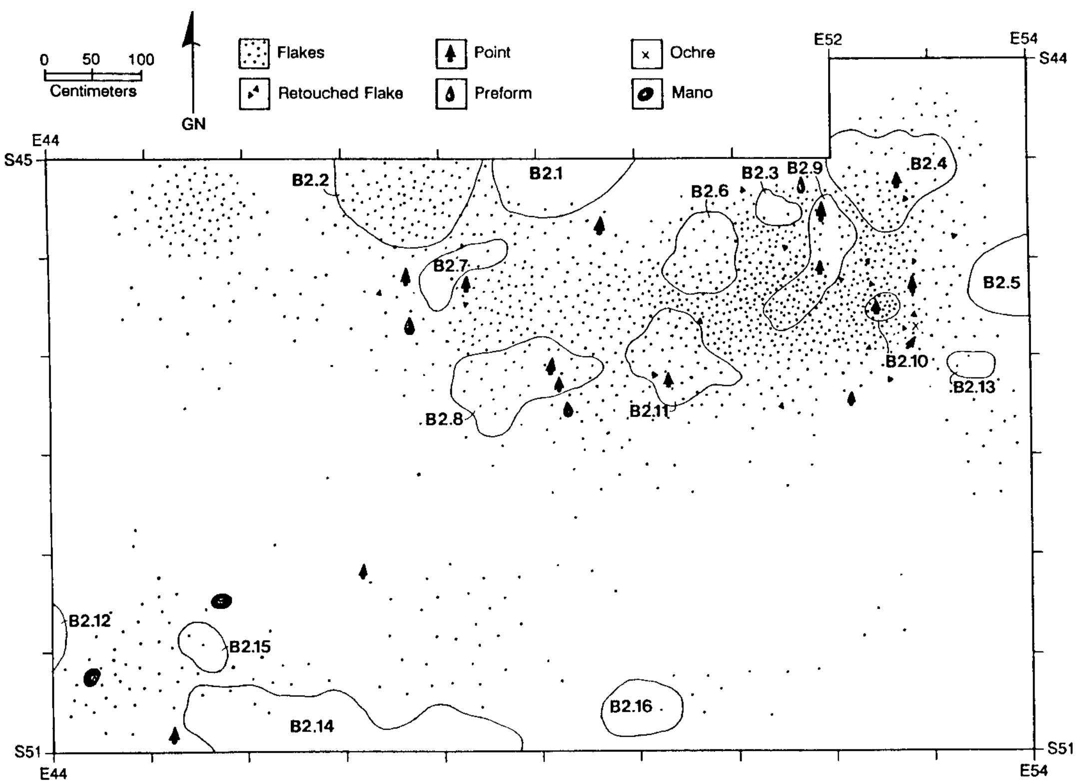

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Archaeological and paleoecological investigations at ten prehistoric sites at Lake Ray Roberts recovered evidence of past lifeways and site formation processes in this region that is ecotonal between the Great Plains and the Gulf Coast Lowlands. Sites ranging in age from Middle Archaic (ca. 7,500-4,500 BP) and Late Prehistoric (ca. 600 BP were studied. These included sites in flood plain as well as terrace settings. Artifact densities and feature/faunal preservation were conditioned by these geologic contexts. In floodplain sites rapid aggradation promoted excellent preservation of serial occupations. These showed rather consistent use of environmental mosaics by mobile hunter-gatherer populations. After the Archaic period, this area was used mainly as part of mobile Late Prehistoric systems, with little evidence of larger, stable settlements.

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SECTION I. INTRODUCTION AND BACKGROUND

CHAPTER 1 INTRODUCTION

This report describes the results of archaeological survey, testing, and excavations at Ray Roberts Lake, located in Denton, Cooke, and Grayson Counties, Texas. This work has been conducted by the Institute of Applied Sciences, University of North Texas (formerly North Texas State University), as part of contract DACW63-86-C-0098, with the Fort Worth District, U.S. Army Corps of Engineers (USACOE). The overall goals of these investigations were to survey the remaining areas of the project, to assess, often with test excavations, the newly discovered sites, and to recommend and implement mitigation efforts at sites determined to be eligible for inclusion in the National Register of Historic Places.

Results of this project represent the last of a series of archaeological investigations in the Ray Roberts Lake project. During early planning phases, the proposed reservoir was referred to as Aubrey Reservoir. An initial reconnaissance survey was conducted in 1973 by Southern Methodist University (Bousman and Verrett 1973). Later surveys, testing and limited excavations were conducted by Environmental Consultants Inc (ECI) (Skinner and Baird 1982, 1985). A reassessment of previously located sites was conducted in 1986 by UNT (Ferring 1986a), resulting in recommendations for testing and mitigation of sites in the project area. UNT began those studies in 1987. Work at Ray Roberts Lake was paralleled by UNT survey testing and mitigation of sites at Lewisville Lake, located abut 25 km down the Elm Fork of the Trinity (Figure 1.1). The conservation pool of that lake was raised as a result of the Ray Roberts impoundment as a new water control facility.

The combined Ray Roberts-Lewisville project has both prehistoric and historic components, and most results of these investigations are reported separately. These reports include the historical archaeology of Ray Roberts Lake (Lebo 1996) and the historical archaeology at Lewisville Lake (Lebo 1995). The survey of the Lewisville Lake shoreline resulted in a report on both prehistoric and historic sites (Lebo and Brown 1990). A separate report was prepared on the archaeological, archival and oral history investigations at the Johnson (41CO248) and Jones (41CO250) homesteads (Lebo 1997). Those sites, situated in the Johnson Branch Park at the completed reservoir, contained important records of the Johnson and Jones families occupations from the mid-nineteenth century until their land was acquired by the government. The Jones Farm site has been preserved intact, and will be used for public exhibits and educational activities.

Mitigation efforts at prehistoric sites are also reported separately. This volume describes those efforts at sites at Ray Roberts Lake, while Ferring and Yates (1997) report on mitigation of sites on the Lewisville Lake shoreline. The last report in this series is dedicated to the excavations and analyses of the Aubrey Clovis Site (41DN479) (Ferring 1997). This site was discovered in the outlet channel of the reservoir, below the dam (Ferring 1989, 1990, 1995a). Buried between 7-9 m below the surface were several concentrations of Clovis artifacts and associated faunal remains. The site yielded a remarkably detailed record of Clovis subsistence, lithic technology and occupation patterns, in a geologic context that also preserved excellent evidence of late Quaternary paleoenvironments.

Ray Roberts Lake (Figure 1.1) is strategically positioned for archaeological research. On the Elm Fork of the Trinity River, the lake encompasses the confluences of several major tributaries, including Isle du Bois Creek and the Elm Fork of the Trinity River. The lake area straddles the ecotone between the Blackland and Grand Prairies and Eastern Cross Timbers. Geographically and ecologically, therefore, this area is important with respect to understanding prehistoric settlement and subsistence patterns. Also, the location of Ray Roberts Lake with respect to other recent archaeological investigations (e.g., Lewisville, Joe Pool, and Lavon lakes) is important in terms of anticipated comparative analysis of archaeological records in different geographic-environmental settings in the North Texas region.

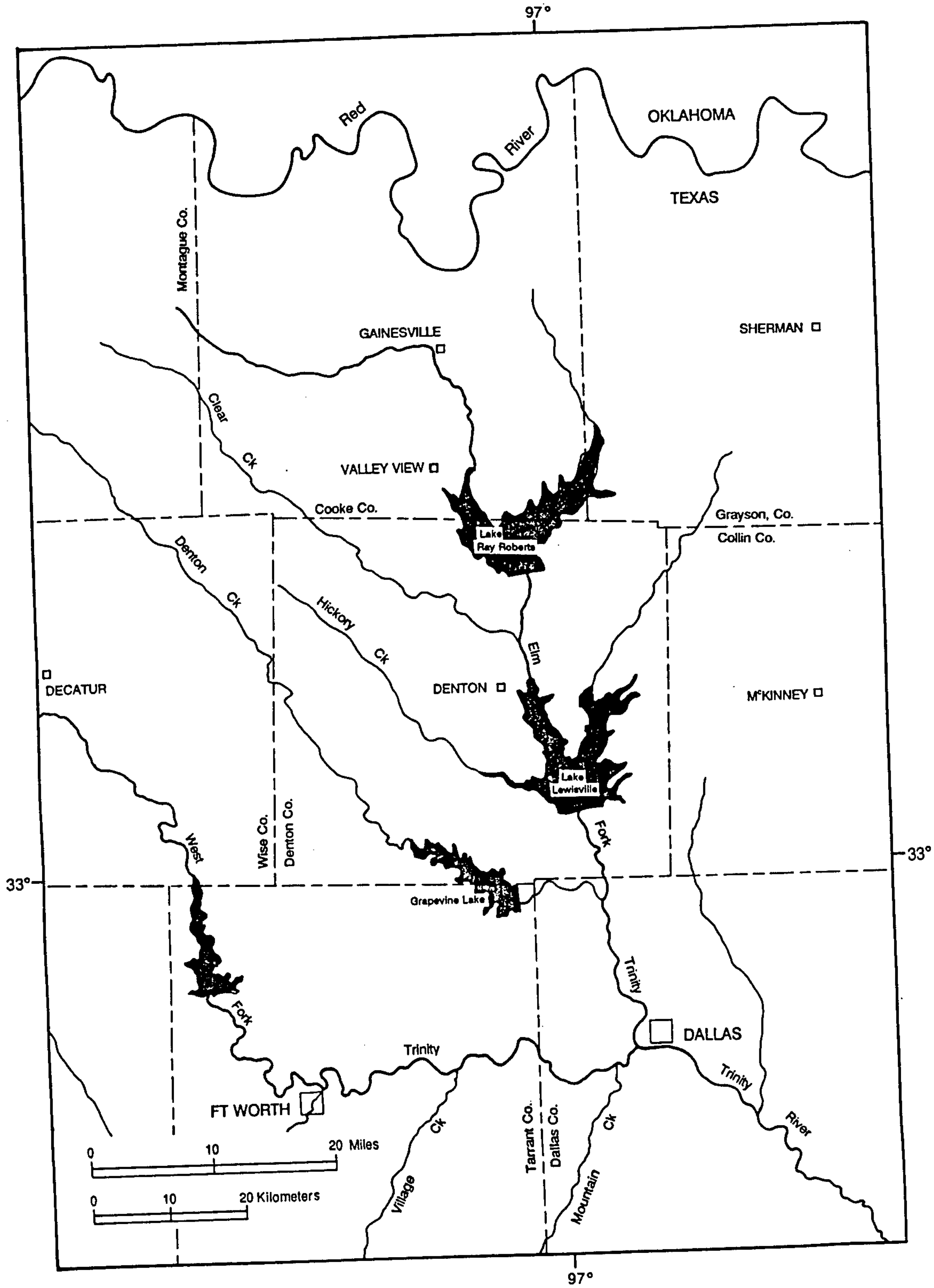


Figure 1.1 Map of north central Texas with Ray Roberts Project area.

CHAPTER 2 PREVIOUS RESEARCH

An archaeological reconnaissance conducted by Southern Methodist University in the early 1970's was the first professional investigation in the project area (Bousman and Verrett 1973). This project documented 27 sites, one of which was an historic occupation, and provided very brief descriptions of the sites and small surface samples of artifacts. A number of these sites had been discovered by King Harris or were known to him.

The first intensive survey was conducted by ECI in 1980 (Skinner et al. 1982a). These survey efforts resulted in the recording of 131 prehistoric sites within the Ray Roberts Lake project area, and initial recommendations concerning further work. ECI also tested a number of sites in the dam and borrow areas (Skinner et al. 1982b). This work included testing at 15 sites with prehistoric components and seven sites with both prehistoric and historic components. Eight of these sites were recommended for nomination to the National Register of Historic Places, and for mitigation; all were in Denton County: [41DN] 79, 81, 85, 99, 101, 102, 103 and 112.

Mitigation efforts in the southern part of the reservoir area were later conducted by ECI on the following sites: [41DN] 79, 81, 85, 101, 102, and 103 (Skinner and Baird 1985). They recommended additional work at DN79, DN81 and DN103. The work conducted by UNT and reported here at Sites 41DN 79, 81, 99, 102 and 103 represents the need for additional investigations as defined by ECI's studies, as well as the reevaluations conducted by UNT in 1986 (Ferring and Yates, 1986b). Testing and mitigation at a number of sites not recorded by ECI followed their discovery during the early stages of this project. Some areas had not been surveyed by ECI because of land acquisition problems; other buried sites, such as 41CO150 and 41CO141 were found during this project as a result of exposures made during bridge construction activities. Prior to this project, limited emergency excavations were conducted at 41CO141 by UNT (Prikryl and Yates, 1987) in portions of the site threatened by construction.

CHAPTER 3 ARCHAEOLOGICAL BACKGROUND

Paleoindian (ca. 11,000-8,500 bp)

While Paleoindian projectile points have been found at a number of localities in this area, sites with unmixed Paleoindian assemblages are extremely rare (Meltzer, 1987). Based on the meager evidence of projectile points found on surface sites, the most common types found are Plainview and Dalton varieties (Prikryl, 1990). Cross-dating with other regions suggest that these types date to ca. 9.5-10 ka. This age corresponds with the onset of alluviation in the Trinity Valley in early Holocene. Typologically, this Dalton-Plainview association suggests that this region was a borderlands between the Rolling and High Plains, where Plainview occupations are concentrated, and the areas to the east where the Dalton culture is concentrated (Johnson, 1987; Johnson and Holliday, 1980; Sellards, 1952).

Clovis occupations in this region have been inferred mainly through surface finds of points (Jenson, 1968; Crook and Harris, 1955; Meltzer, 1987). The Lewisville Site has long been the only claim for an in situ Clovis site (Crook and Harris, 1957; 1958). The greater than 37 ka age for the site has served as a constant source of controversy. Apparently mixed faunal assemblages, the discovery of only one diagnostic artifact (out of 6) and a lack of reliable data on the age and geology of the site has limited the potential contributions this site may have made to Clovis studies, even assuming that the cultural affiliation could be firmly demonstrated. Mixture of lignite with charcoal apparently was responsible for the erroneous radiocarbon ages (Stanford, 1983).

As the prior discussion of the geologic history of the Trinity Valley clearly indicates, the claim that the Clovis material at Lewisville was contained in situ within the terrace fill must be incorrect. Aubrey Site data show conclusively that the Trinity flood plain was 8-14 m below the present flood plain at 11 ka. The "hearths" and other materials were claimed to have been in situ in the "Shuler Formation" (Crook and Harris, 1957), well above the present flood plain. This stratigraphic position would correspond with the Coppell Alluvium (Ferring, 1986c; 1990c), and is much too old to contain Clovis materials buried by alluvium. The features, artifacts and faunal materials at the Lewisville Site could only be of Clovis age <u>and</u> in situ if they were emplaced on an eroded bench and later covered by colluvium (Stanford, 1983). Among other reasons, I suspect that the exposure of these materials in a large borrow pit and the lack of control on the sediments overlying the features prior to construction have contributed to confusion over this site's geologic history.

Investigations at the Aubrey Clovis Site will add considerable data to knowledge concerning Clovis occupations in this region (Ferring, 1989b, 1989c, 1990c, 1995a). This in situ site has yielded evidence of faunal procurement and intrasite activities that include food processing, tool manufacture and tool rejuvenation. Excavation of ca. 200 square meters of in situ camp surfaces enabled analysis of spatial patterning of activities. All of the lithic raw materials at the site are exotic to this region, indicating long-distance procurement by direct, acquisition or exchange took place. The tool and debitage samples of ca. 10,000 artifacts indicate a high degree of raw material curation coupled with intensive tool utilization. Large bifacial blanks-cores were reduced on the site, as were small cores that yielded small flakes and also bladelets. Large blade tools and blade blanks were imported to the site, as was one core tablet from a large blade core. In addition to many retouched and utilized pieces, the assemblage includes typical end scrapers, gravers and multiple gravers, one Clovis point and several biface fragments. Faunal analyses indicate broad exploitation of large, medium and small game taxa, including bison, deer, rabbits, squirrels, fish, and abundant turtle. Mammoth remains are present, but their exploitation has not been substantiated. Spatial pattering and raw material comparisons between camp areas suggest a single group occupied the site either once or over a series of brief occupations. A highly differentiated set of exploitative tasks are indicated, probably signifying that Clovis people employed very flexible adaptive strategies.

Early Archaic (ca. 8,500-6,000 bp)

Wetter climates appear to have characterized this period. Grasses were probably dominant between 9,000 and 5,000 BP (Ferring 1993; Humphrey and Ferring 1994; Prikryl 1987:156). Like the preceding

Paleoindian period, peoples assigned to the Early Archaic are believed to have continued with a nomadic lifeway based upon a diffuse subsistence economy with no archaeological evidence of territorial boundaries (Prikryl 1987:160). Human population density continued to be low (Lynott 1981:103). Evidence of Early Archaic period occupations in the Ray Roberts Lake area comes primarily from surface finds of the Angostura and early split stemmed projectile point types (Prikryl 1987:158-161). An Early-Middle Archaic period component was excavated at 41DN20 at Lake Lewisville (Ferring and Yates 1997), but this did not yield evidence of subsistence or paleoenvironments.

Middle Archaic (ca. 6,000-3,500 bp)

Localities yielding Middle Archaic artifacts are rare in this region. In the middle Elm Fork Trinity Valley, points of this general age are found at fewer localities than are points of any other age (Prikryl, 1990). Sites of this age are also extremely rare in the Rolling Plains and on the High Plains (Johnson, 1987; Ferring 1995b), where Middle Archaic people routinely excavate water wells at sites such as Mustang Springs (Meltzer 1987) and Blackwater Draw (Haynes and Agogino 1966). In addition to problems of deep burial, dry climates and reduced occupation potentials are probably important factors in the small number of sites dating to this period. In the Trinity Valley, no in situ sites of this age had been discovered until excavations at the Calvert Site (41DN102) revealed in situ Middle Archaic occupation materials. This site is reported in this volume.

Late Archaic (ca. 3,500-1,250 bp)

As in adjacent regions (Ferring, 1988b), sites of Late Archaic age are by far the most common in the archaeological record of this region. The abundance of sites is probably not explained simply by shallow burial and easy detection. Rather, when terrace localities alone are compared, Late Archaic artifacts and sites are 2-3 times more common than for any other archaeological period (Prikryl, 1990). However, because of shallow burial below flood plains, in situ sites with well preserved living surfaces, features and biotic remains have been found to be very common along the Trinity. Because of the large number of buried sites, total site density estimates are probably conservative. Apparently large populations of hunter-gatherers lived in this region in this period, particularly between ca. 3,000-1,800 ka. Faunal data show that Late Archaic populations exploited a mix of prairie, forest and riparian species. White tailed deer, rabbits, turtles and mussels were the most commonly procured. Unfortunately few data are available to document patterns of native plant use.

In situ Late Archaic sites are found along flood plains of most streams in this region. Sites are typically small, but occur in large numbers. A few show clear evidence of repeated occupations, and sites with higher artifact densities probably reflect repeated use as well. No architectural remains have been documented, and no evidence of plant domestication has been found. These populations were hunter-gatherers, exploiting an apparent abundance of wild food resources. This period is also characterized by diminished long-distance mobility and/or exchange, as inferred from the preponderance of locally derived lithic materials. Prikryl's (1990) analysis of tool raw material types showed that only 39% of the Late Archaic tools were made from chert, none of which are local to his study area. By contrast, Early-Middle Archaic and Late Prehistoric assemblages average 70-80% chert raw materials for tools. Intensive use of local materials is characteristic of the Late Archaic period over much of the Southern Plains (Ferring, 1982; 1986b).

Late Prehistoric (1,250-350 bp)

The Late Prehistoric period is marked by the appearance of ceramics, and the common use of arrow points. More important changes include shifts in settlement patterns to larger sites that contain features including houses. Use of domesticates is indicated at several sites (Peter and McGregor, 1988), but is not presumed to have been a dominant economic focus. Bison bones have been described more commonly in faunal assemblages dating to ca. 650-300 bp (Lynott, 1981). Late Prehistoric bison kills have been excavated on Denton Creek (Morris and Morris, 1970) and on White Rock Creek (Harris and Harris, 1970).

Although Prikryl (1990) divides the late Prehistoric into two phases (at ca. 750 bp) based on projectile point types, the number of sites with discrete assemblages is very small, and the great majority of his Late Prehistoric sites have points assigned to both phases. In the later parts of this period, Plains Village (Wedel, 1961; Ferring, 1986b) traits are more common in assemblages from the Elm Fork Trinity Valley. Caddoan traits are more common in sites from the East Fork Trinity Valley (Lynott, 1975; 1981). Thus, in Late Prehistoric times both temporal and cultural factors contribute to archaeological complexity. Excavations of several Late Prehistoric sites at Lake Ray Roberts and Lake Lewisville by the University of North Texas, and excavations at other local reservoirs (Peter and McGregor, 1988; Lynott, 1975) provide examples of in situ archaeological sites.

CHAPTER 4
RESEARCH STRATEGY AND METHODS

General Issues

Implicit in cultural resources projects such as Ray Roberts is the opportunity to investigate a record of human cultural dynamics within a defined region, ranging from the initial occupations to the present. Such investigations must be conducted from chosen theoretical perspectives and with chosen strategies of data collection and analysis. The fact that these are parts of a broader attempt to mitigate known and potential impacts associated with federal land use, i.e., that these investigations are integral to cultural resource management (CRM), is not an incidental issue. We approach both the tasks set out in the scope of work and the specific cultural resources sites as part of a strategy to offset unavoidable loss of cultural resources and to minimize future losses or impacts. For practical purposes, we assume that many of the sites to be investigated will either be destroyed or will be inaccessible for archaeological study for many decades to come. Under these circumstances, which are common to CRM investigations, we suggest that the chosen theoretical issues and the chosen research strategies should exhibit full concern for the state of archaeological and historical knowledge in the region and for the discipline. Our commitment in this respect is to maximize consideration of recognized deficiencies in knowledge concerning cultural history and cultural process in this region, to maximize use of methods and techniques that have been shown effective in addressing those deficiencies, and to exploit, wherever possible, methods enhancing comparability of our research with that conducted by other institutions and other agencies in this region. We will clearly define the difference between standard research methods and those that are innovative or experimental.

The Ray Roberts area is an ideal setting for conducting archaeological and historical research. It encompasses two major environmental zones, the Cross Timbers and the Blackland Prairie (Dyksterhuis 1946). This environmental dichotomy is evident in both floral and faunal resources. Since climatic conditions are uniform over the project area, the basis for environmental diversity is attributable to other factors: bedrock geology, soils, and the results of differential hydrologic regimes within the project area. The details of these factors are described elsewhere (Ferring 1986a, 1986b). The importance of bedrock geology as a fundamental control of ecosystems and landform development is critical to the formulation of a strategy for investigating cultural ecology in the project area. The different lithologies (limestones, marls, sandstones, and shales) have different and predictable potentials for erosion, soil formation, and groundwater storage and release. In turn, these edaphic and hydrologic parameters define constraints on native vegetation, which in turn constitute habitats for animals. Thus, landforms, soils, ground and surface water, vegetation, and animal populations are distributed and related in dependent fashion. Ecologic and biogeographic relations within the project area at any given time are highly constrained by these factors.

Only two other factors are important with respect to local ecology and biogeography: climatic change and human alteration of the physical-biotic landscape. Both of these factors are related and, together with the other factors mentioned, constitute a framework for investigating cultural ecology and landscape evolution. Also, climatic conditions and human populations have changed throughout the 12,000 years of human occupation of this area. The goal of this project is to investigate the processes and results of changing cultural systems in the Ray Roberts area, to relate these processes to regional records, and to explain these processes in terms of anthropological theory. The dichotomization of prehistoric and historic research methods in this proposal is simply an artifact of the qualitative and quantitative differences in the nature of evidence for human lifeways between these two cultural eras. Conceptually, these two eras will be studied in similar fashion. Briefly, the implications of the ecologic setting and ecologic relationships will be defined for prehistoric and historic foci of the research design.

Prehistoric Issues

The culture history and cultural ecology of the Ray Roberts area shall be addressed within a context of changing landscapes, changing plant and animal resources, and population dynamics. Understanding past environments in this area must begin with description of modern landforms, biotic communities, and climate/ hydrology. These provide a basis for studying past environments using geomorphology, soils, pollen, mollusks, and vertebrates recovered from well-dated stratigraphic units in the project area. Since many of these data will be recovered from archaeological sites, a basis for relating past environments to past adaptive strategies will be established. The distinct biogeographic zonation in the project area today is expected to have prevailed in the past as well; therefore, the principal focus for change is climatic variation during the late Pleistocene and throughout the Holocene. These records will be used to define probable shifts in resource availability, emphasizing both character and abundance of resources within the geographic mosaic of the project area. This biogeographic reconstruction provides the basis for spatial analysis of settlement locations relative to critical resources. The next scale of analysis focuses on how specific places (sites) were used within this mosaic during different time periods and under potentially changing environmental conditions. "Place" analysis, i.e., site analysis, will be guided by the goal of defining patterns of mobility (including periodicity and intensity of occupations), as well as the specific resource extraction and processing activities that are associated with sites. For stratified sites (of which there are several in the Scope of Work), emphasis will be placed on temporal change in patterns of site use. A clear focus for these studies will be the evaluation of site-use change relative to changing resource availabilities.

These analyses will require very specific kinds of data, including but not limited to: (1) a well-defined stratigraphic framework for the Pleistocene and Holocene sediments in the project area (2) a geomorphic model of landforms in the project area integrated with the stratigraphy, (3) a radiocarbon chronology for the sediments and landforms, (4) evidence of past environments, including pollen, mollusks, vertebrates, and soils, (5) a site-location data base fully integrated into the geologic framework as well as the biogeographic framework, (6) a chronology of the sites, including dated episodes of site use, (7) data permitting site-use histories: spatial patterning and feature associations, (8) data on site activities: tools, cores, debitage, and ceramics, (9) evidence of external contacts and intersite cultural affiliations: tool and ceramic styles as well as mineralogic analysis of stone and ceramic materials, (10) a set of analytical procedures to integrate patterns of intrasite variability with patterns of intersite variability, and (11) a set of research hypotheses and theoretical constructs to explain the observed variability with reference to population dynamics, resource availability, and exploitation patterns. The result will be a spatial-temporal model of adaptive strategies and cultural evolution, i.e., a model of cultural ecology (cf. Butzer 1982). A necessary outcome of such a model is a clear understanding of cultural history in this area, including comparison of the Ray Roberts area to other studies in this region, e.g., Richland Chambers (Raab et al. 1982) and Joe Pool (Raab et al. 1980), Lavon (Lynott 1975), and also including smaller projects and avocational projects (cf. Lynott 1977).

Site Formation Processes

A guiding perspective for both prehistoric and historic investigations on this project will be site formation processes (Schiffer 1976,1983; Butzer 1982). This is an area of prehistoric archaeology that has made significant contributions to the study of site construction and site modification (Ferring 1986c). Essentially, the approach involves identifying the cultural and natural processes that shaped the resulting archaeological record. The intensity and repetitive aspects of site use are related to potential disturbance or mixture of artifacts and features. Erosion, weathering, bioturbation, pedoturbation, and other natural agents modify the character of the archaeological materials and features. These all impact on the character of the preserved archaeological record and our ability to infer primary patterns of site use from that record. Our emphasis will not be strictly on site modification (cf. Wood and Johnson 1978), but rather on the joint consideration of site construction (including cultural activities within a given site formation environment) and the subsequent modification or alteration of that primary record.

This approach has already been used in the Ray Roberts project to investigate 41C0141 (Ferring 1986b), with promising results. Prehistoric sites in different geologic settings have been shown to have quite different formation contexts. Terrace sites, for example, exhibit much higher potentials for bioturbation and mixture of debris from serial occupation; by contrast, floodplain settings have better potentials for burial, superpositioning, and preservation of artifacts, faunas, and features. Thus, contrasting models of site formation will be proposed and tested for terrace sites (e.g., 41DN79, 41DN81) as opposed to floodplain sites (e.g., 41C0141, 41C0150).

Similar approaches will be used to evaluate newly discovered sites, resulting in more efficient development of mitigation and management plans. In terms of the theoretical goals of the project, the issue of site formation is critical. Those dimensions of the archaeological record addressed by site formation analysis are critical to the study of intrasite patterning, artifact densities, spatial association of artifacts and features, and relative faunal preservation, and therefore must be considered in any evaluation of intrasite and intersite variability.

A major innovative approach we will use at Ray Roberts is the development and application of site formation approaches to historical sites. Previously this has not been addressed, despite the increasing emphasis on sheet refuse as an indicator of site-use patterns (Moir 1982). We will explicitly consider site construction and site modification at historic localities in order to assess the different processes that have shaped the resulting archaeological records at these sites. For example, historical sites are subject to the same constructional processes as prehistoric sites with respect to duration and character of occupations. Sites occupied over long intervals should exhibit less clear spatial patterning and greater degrees of mixing than sites occupied only briefly. How do these patterns relate to landscape positioning? For example, we will contrast site formation on shallow clay soils with those on deeper sandy soils, where bioturbation and mixing potentials are different. What are the post-occupational patterns of site formation on sites with standing architecture as opposed to those which have only archaeological evidence of architecture? We will focus excavation and testing strategies to evaluate these differences; these strategies will include an evaluation of sheet-refuse testing methods as opposed to small block or trench excavations. Similarly, we will evaluate the record of sites in which structures have deteriorated over a long interval as opposed to those which burned. We will also evaluate sampling strategies designed efficiently to define patterns of intrasite variability relating to primary occupation patterns, effects of duration and change in occupation, and post-occupational site modification. For example, structure classifications and features will be used to stratify site areas prior to testing. These samples will be evaluated relative to sheet-refuse excavation results as well as limited block and/or feature excavation.

PREHISTORIC RESEARCH DESIGN

Introduction

The following section of the research design contains the research hypotheses that will structure prehistoric research at Lake Ray Roberts and Lake Lewisville. The hypotheses have been selected to address problems identified through a review of regional archaeological research and from our concern for broader theoretical issues. These two kinds of concern are not separate, but rather are integrated into the research structure. Following presentation and discussion of the research hypotheses are discussions concerning the data requirements for testing the hypotheses and a discussion of the methodological implications of the hypotheses and data requirements.

RESEARCH HYPOTHESES

Sociocultural Problems

One of the prominent deficiencies in the archaeological studies of this region is an inadequate control on the sociocultural affiliations of prehistoric populations through time. Geographically, the Upper Trinity River Basin is situated between two major culture areas, the Plains and the Piney Woods of East Texas. Archaeologically defined cultures have been assigned to local traditions or related to cultures of the peripheral areas. In other cases, cultural affiliations have been given new, local status (e.g., Trinity Focus, Elam Focus) without clear investigation of external and internal relations. One of our main objectives is to evaluate critically the sociocultural affiliations of prehistoric populations that inhabited the study area, emphasizing both internal and external relations and the character of those relations. This set of problems clearly entails synchronic and diachronic perspectives, hypotheses, and methods of analysis. Synchronic considerations, the complex of events existing in limited time periods and ignoring historical antecedents, will be dealt with first. Diachronic considerations, taken up in the next section, involve mechanisms and processes of adaptive change through time and logically follow investigation of synchronic patterns.

Research Hypotheses

RH1: Within the study-area portions of the Upper Trinity River Basin, local populations were part of autonomous cultural traditions and culture groups.

I1: Assemblages and assemblage groups from the study area, within well-dated temporal spans, exhibit technostylistic patterns that contrast with those of peripheral cultural traditions and culture groups. For example, culturally diagnostic patterns of lithic reduction, ceramic technology, and stone tool/ceramic styles should exhibit greater inter-area variation than intra-area variation.

I2: Local, autonomous cultures will have maintained trade relations with external groups; trade relations will be evident in the form of raw material and/or finished implement items. The latter will exhibit nonlocal raw materials as well as nonlocal technological attributes. These trade items will occur in low frequency in assemblages dominated by items made within local technostylistic patterns.

I3: Local groups will have maintained, at certain times, contacts with external groups, relations that stimulated diffusion of ideas and technostylistic traits. Local imitations of foreign artifacts will be evident in the form of artifacts made with local raw materials but with imitated styles and possibly techniques. These artifacts will occur as small portions of assemblages dominated by artifacts made in local technostylistic patterns.

Alternate Hypotheses

RHA1: At certain times, local populations were peripheral components of cultural traditions and culture groups that were centered away from the Upper Trinity River Basin.

I1: Technostylistic variability within local assemblages is greater than variability between local assemblages and non-local ones.

I2: Artifacts within assemblages are made with similar styles and techniques to those from nonlocal assemblages, but using local raw materials. Artifacts similar to nonlocal ones are dominant in local assemblages. These patterns must be exhibited for multiple local assemblages with similar chronological placement to control for possible short-term migration of nonlocal groups into the project area.

Sociocultural Change

The evaluation of sociocultural change is an integral aspect of broader considerations of cultural-ecological change. Here, the discussion focuses on cultural traditions per se, rather than change in adaptive strategies, settlement systems, economic factors, etc. The objective is to monitor cultural traditions in terms approximating ethnicity. Accordingly, emphasis is placed on sociocultural relations divorced as much as practical from measures of association deriving from economic-functional factors.

Research Hypotheses

RH2: Sociocultural change in the project area from one cultural pattern to a subsequent one was the result of internal processes, particularly innovation.

I1: Technostylistic patterns of the subsequent pattern are consequent to earlier patterns and are evident in the form of partial technostylistic transformations of behavioral patterns. For example, changes in ceramic or lithic tool styles will be independent and out of phase.

I2: The hypothesis of local, innovative change will be rejected if subsequent technostylistic patterns have synchronous or prior analogues in nonlocal traditions. Obviously, these relations are understood in proportion to the detail of nonlocal archaeological records of technostylistic change and are fully contingent on the results of external research.

Alternative Hypotheses

RHA2: Sociocultural change in the project area is the result of stimulus diffusion from external cultural traditions.

I1: Technostylistic changes evident in local assemblages are consequent to patterns observed in nonlocal traditions. That is, specified technostylistic patterns (e.g., ceramics, projectile point styles) are evident in nonlocal contexts prior to their appearance in local assemblages.

I2: Diffusion of certain technostylistic patterns entails partial or out-of-phase changes in different behaviors. For example, ceramic and lithic changes will not be synchronous.

Adaptive Change

Adaptive changes must be considered as long-term, successful changes in cultural systems resulting in demographic and/or economic success of populations (cf. Butzer 1982: 282). This contrasts with short-term oscillations in adaptive strategies as a result of internal or external factors (climate change, disease, warfare, etc). To distinguish between these long-term processes and the less significant short-term fluctuations in cultural systems is difficult and demanding of both data and analytical methods. Our focus is on evaluating medium- to long-range adaptive changes by local populations in response to several internal and external stimuli and by several processes. This is clearly the most complex area of our prehistoric investigations and the area most susceptible to constraints imposed by data recovery. Our approach is guided by the tenet that understanding medium- to long-term changes in adaptive strategies requires prior definition of adaptive systems on a synchronic scale. That is to say, the character of systems at a given time must be established prior to the analysis of adaptive change. We can expect, therefore, to contribute to regional goals of adaptive change studies even if long-term records of change cannot be recovered from the project area because of poor exposures, deep burial, inadequate dating potentials, poor preservation of faunal-floral remains, or other reasons. Implicit in the following research hypotheses and concomitant methodological discussions is the realization that our research is oriented toward a regional effort in assessing prehistoric adaptive change, regardless of empirical limitations on a project-area scale. At the same time, our approach is designed with knowledge of the project area in mind, and immediate contributions are indeed expected to certain scales.

The study of adaptive change is necessarily an investigation into the causes of change and the processes of change. Alternatives have been defined for both causes and processes, and the range of alternatives is such that chosen emphases are required of any given project. Our task is partially simplified, since there is no evidence that we will encounter complex social structures or complex technologies of food production, irrigation, etc. Rather, we can center on the factors and processes most germane to the study of hunter-gatherer and horticultural systems.

Adaptive change in socioeconomic systems entails different kinds of stimuli, different processes of change, and different kinds of change from those of sociocultural systems. The considerations here include factors such as trade and diffusion, both of which are forms of external stimuli; with respect to adaptive change, these factors are treated differently than in a context of investigating sociocultural change (see above discussions). The focus here is on how these factors relate to potential changes in local demographic-economic systems, not ethnicity. Environmental change, manifested in the form of different resource availabilities, will be investigated as a potential stimulus for adaptive change. Complex responses to resource availability shifts may include realignments of sociocultural relations, such as through trade, or even more pervasive changes entailing migration. Clearly, studying adaptive change is fundamentally related to the testing of other research hypotheses. Recognition of the interrelationships among the research hypotheses is an inherent aspect of our research design. Separate consideration of adaptive change from sociocultural change is logistically and methodologically sound, however, since independent testing of hypotheses, using discrete data, will improve the subsequent task of interpreting adaptive change relative to sociocultural change.

Stimuli of Change

Both external and internal stimuli for adaptive change will be considered. More to the point, methodological strategies are proposed that will enable us to document the presence of the stimuli.

Medium- to long-range shifts in resource availability and productivity are fundamentally related to both positive and negative shifts in potentials to maintain existing adaptive systems. Our focus will be defining rates and dimensions of resource shifts indirectly through reconstruction of climate, vegetation, and hydrologic regimes. Direct measurements of plant-animal resource productivity are impossible to attain.

Other external stimuli include diffusion of technologies and trade relations. Technological variables encompass implements, facilities, and also food production (i.e., domesticates). Trade relations and diffusion will be established in the course of investigating sociocultural relations and sociocultural change.

Internal stimuli for change include technological innovations in weapons, facilities for food procurement and processing, and changes in social-functional organization that change energy procurement and processing efficiency. Population change is an important stimulus for change but will be viewed here as a factor contingent on other stimuli, especially technologically and environmentally stimulated changes in resource procurement potentials.

Response Factors

Adaptive change is manifested in different ways, and different archaeological evidence for adaptive changes must be sought in order to explicate better the character of adaptive response to the stimuli outlined above. In most cases, complex changes in settlement and subsistence patterns, technology, and social organization may be expected even with hunter-gatherer populations. For example, changes in population density will almost inevitably be accompanied by shifts in settlement pattern, mobility, and resource utilization patterns. Therefore, complex responses must be accommodated into the structure of research hypotheses and implications. Also, multiple, independent kinds of evidence for different kinds of response should be identified to diminish circularity of "explanations" for adaptive changes and to add strength to the separate lines of hypothesis testing.

Population density is a critical variable in assessing adaptive change, yet it is perhaps the most difficult to define archaeologically. Only weak measurements of total population and population density are possible to achieve; therefore, the focus should be on relative measures of change, controlling as far as possible for constraining variables. For example, if the number of sites is used as a variable in estimating population density in a certain period, then surface exposure of sediments of the same and younger ages should be used as a control on survey data used to estimate the number of sites. As population densities decrease, the potential for sampling error increases; therefore, the reliability of population estimates will be diminished for periods of low occupation frequency. These kinds of limitations also pertain to the definition of group mobility and seasonality when these must be estimated with multisite data.

Resource acquisition and processing patterns are obviously critical targets of adaptive studies. Measures of seasonality, patch utilization, resource diversity, and procurement-processing cost are difficult at best to acquire. Again, relative estimates of these variables are necessary, and controls for differential preservation or recovery of faunal-floral remains must be accommodated into hypothesis testing. Geoarchaeological controls on organic preservation are necessary, and intra-project differences in preservation potentials have to be defined for specific geomorphic and stratigraphic features of site contexts for different time periods.

Research Hypotheses

RH3: Medium- to long-term increases in resource availability, stimulated by climatic change, caused local adaptive systems to become increasingly stabilized, resulting in decreased mobility, increased specialization of patch exploitation, and decreased diversity of floral-faunal resource procurement practices.

I1: Within-site evidence of repeated occupations will denote fewer episodes of site use per time interval and more intensive occupation patterns per occupation episode.

I2: Multisite settlement data will show fewer sites per occupation period, controlling for site visibility and preservation.

I3: Series of occupations, within and among sites, will reveal evidence of decreasing variability in floral-faunal assemblages as occupation intensity increases. These declining diversity indices will also show evidence of focus on more productive patches and more productive plant-animal taxa.

I4: Increasing stability of populations will favor intensification of trade-exchange relations with external groups, resulting in increased potential for diffusion of technostylistic traits.

RH4: Declining resource availability, caused by climatic deterioration, will result in reduced population or increased mobility of existing population units. Increasingly diverse patch exploitation and increasingly diverse taxa exploitation will ensue, reflecting greater stress on population demands for food income and broadened search-procurement strategies.

I1: Intrasite evidence for occupation patterns will denote frequent, low intensity occupation patterns, as shown by spatial patterning, feature use patterns, time-controlled density of tool use, and food processing debris.

I2: Intersite data will show fewer sites per time interval, controlling for site exposure and preservation, each of which exhibits evidence of non-intensive occupations. More diverse site settings will also be evident in response to more diverse patch exploitation.

I3: Floral-faunal remains at sites will denote increased diversity of taxa exploitation, coupled with evidence for only stable or possibly declining total exploitation efficiency. Emphasis on less productive patches and less productive taxa will also be evident.

RH5: Adaptive changes in the project area were caused mainly by external influences, primarily diffusion of new technologies, including domesticates. Evidence for adaptive change will not coincide with evidence for environmental change. Alternately, certain kinds of environmental change may result in favorable settings for external influence, resulting in mixed stimuli for local adaptive change.

I1: Local adaptive strategies will shift toward greater resource procurement-production efficiency, coupled with evidence for external contacts, such as new technostylistic patterns.

I2: Food production, if evident, will be accompanied by settlement shifts to settings most favorable to horticulture, with attendant exploitation of other patches via temporary or seasonal camps. The latter will denote patch exploitation that is seasonally and demographically consistent with commitments to horticultural activities.

PREHISTORIC DATA REQUIREMENTS

This section of the research design describes the kinds of data that are necessary to test the research hypotheses. These data are grouped according to categories reflecting the major kinds of cultural, functional, or behavioral entities considered within a hypothesis-implications set. Defining these data requirements is a prerequisite to outlining methods of data collection and data analysis.

Sociocultural Affiliations

Defining sociocultural affiliations is necessary within the project area and also between the project area and adjacent regions. The former requires collection of primary data; the latter requires the assembly of data published for other sites in adjacent regions (e.g., Plains, Caddoan area). The kinds of data necessary to define sociocultural affiliation and relations are: (1) stylistic attributes of artifacts, e.g., projectile point shapes, ceramic decorative motifs, etc., (2) nonfunctional architectural data, e.g., house floorplans, feature arrangements, etc., (3) burial architecture, (4) technological 'style,' e.g., ceramic manufacturing technique, lithic reduction style, and (5) raw materials for artifacts as controls on manufacturing locality, possible trade, e.g., ceramic temper, clay types, lithic raw materials, etc. These require control on both local and nonlocal raw material characteristics.

Raw Material Acquisition and Processing

A major aspect of settlement systems analysis entails consideration of raw materials acquisition and processing from both locational and behavioral perspectives. Data needed to consider these parameters include: (1) sources of lithic and ceramic raw materials within and away from the project area, (2) locational information on possible phasing of raw material acquisition and processing, e.g., lithic quarry sites, final location of tool manufacture, etc., (3) technological aspects of raw material processing, e.g., heat treating of lithic raw materials or processing of bone into tools, (4) estimates of energy expenditures involved in procuring raw materials, including scheduling conflicts associated with other procurement tasks; these will be estimated using distance-to-source measures relative to site locations, etc., and (5) technological models of raw material processing to join this area of data collection with those relating to on-site activities involving food resource processing, e.g., lithic tool curation as evidenced by tool discard patterns, distribution of resharpening debris relative to tool manufacture areas and food processing areas.

Food Resource Acquisition and Processing

Data necessary to evaluate food acquisition and processing include: (1) taxonomic and anatomical analysis of faunal remains, (2) age and sex analysis of faunal remains, (3) taxonomic analysis of plant remains (pollen or macrofossils), (4) habitat and patch analysis of plant and animal resources remains at sites, (5) population analysis of food resources (density, mobility, predictability, seasonality, exploitation potentials, etc.), (6) food values (nutritional, caloric) of food resources, (7) processing and storage processes (butchering, plant preparation, cooking-fat rendering, storability, etc.), and (8) procurement location and technique data, archaeological and ethnographic (hunting, trapping, collection, etc.), accompanying energy efficiency data such as distance to resource, density of resource, yield per effort unit, etc.

Resource Availability

Data pertaining to resource availability include: (1) climatic reconstructions (see below), and (2) soils-vegetation-hydrology mosaics of the project area, coupling study of modern regimes with models of past regimes under different climatic-geomorphic-hydrologic conditions.

Settlement Systems

Data pertaining to the reconstruction of settlement systems include: (1) site locations relative to landforms, hydrologic factors, soils, and vegetation (present and reconstructed), (2) site size, (3) spatial clustering and spatial coassociations of tools, debris, and features, (4) measures of site-use intensity, including artifact deposition rates, tool use and discard patterns, feature density and use patterns, architectural remains, and volume of food remains, (5) measures of site-use periodicity, including evidence of seasonality (macrofossils, molluscs, deer elements, etc.), and (6) multisite comparative data bearing on intersite differences in activities, resource procurement practices, and sociocultural affiliations.

Chronological Controls

A chronologic framework is essential for assessing each of the research hypotheses. Chronologic data include: (1) relative dating of geomorphic and soils-stratigraphic units, (2) absolute dating of sediments and archaeological units via radiocarbon, thermoluminesence, or uranium series, and (3) relative dating of assemblages via seriation and comparison with other dated cultural sequences.

Site Exposure and Preservation

Controlling for site exposure and preservation is essential for assessing site density in any given temporal unit or in any given geographic-environmental segment of the project area. Data bearing on site exposure and preservation control include: (1) geomorphic assessment of land-surface age and exposure period, (2) recent histories of sedimentation by fluvial and colluvial mechanisms causing possible site burial and concealment, (3) detailed soils-stratigraphic framework, and (4) evidence of post-occupation weathering and disturbance histories as these bear on site preservation.

Site Formation Processes

Beyond issues of site preservation and exposure, data are required to permit reconstruction of site formation histories, since these processes have important implications for interpreting artifact and feature preservation, artifact deposition rates, spatial patterning, and so on. Data include: (1) estimated rates of sedimentation, (2) evidence for compaction of sediments, (3) evidence for bioturbation, pedoturbation, and erosion, and (4) evidence of selective diagenesis or other alteration of floral and faunal remains.

PART II: RESEARCH SETTING

CHAPTER 5 GEOLOGIC AND PHYSIOGRAPHIC SETTING

Ray Roberts Lake is located in the upper part of the Elm Fork Trinity River drainage basin in North Central Texas (Figure 5.1). The overall setting for the project is the Upper Trinity River Drainage basin, as described below.

The Upper Trinity Drainage basin is located in north central Texas at the boundary between the southern Osage Plains and the Gulf Coastal Plain physiographic provinces (Fenneman, 1931; 1938). This drainage basin is bounded by three other major drainage basins: the Red River to the west, north and east; the Brazos to the west-southwest, and the Sabine to the east. Ecologically, the area is transitional from the southern prairie-plains to the East Texas forests.

Bedrock Geology

The entire Upper Trinity River drainage basin has developed over relatively soft late Paleozoic and Cretaceous sedimentary rocks (Hill, 1901; Shuler, 1918; Winton, 1925; Barnes, 1967; 1988; Hendricks, 1976). The West Fork Trinity River heads to the northwest of Fort Worth where Pennsylvanian sandstones and shales crop out. All other portions of the Upper Trinity drainage basin have outcrops of Cretaceous sedimentary rocks (Figure 5.2).

In the Upper Trinity Drainage basin, the bedrock units exposed at the surface belong to Cretaceous stratigraphic units (Table 5.1). The lithologic differences among these sedimentary rocks are essential components of landscape evolution, including drainage network development, soils genesis and supply of alluvial parent materials.

With respect to Quaternary geologic and environmental history, the bedrock geology of the Upper Trinity River drainage basin is important for assessing bedrock as: a) a resistive component of landform evolution, b) parent materials for soils, and c) sources of alluvial, colluvial and eolian sediments.

Regional Geomorphology

Bedrock lithology is the principal factor that has influenced development of regional geomorphology. Four major upland geomorphic/physiographic subdivisions are recognized (Hill, 1901; Fenneman, 1938): Western Cross Timbers, Fort Worth Prairie, Eastern Cross Timbers and Black Prairie. Because climatic variation within this region is minor, differences in landforms, soils and vegetation among the four upland subdivisions are attributed to different bedrock lithology.

The Western Cross Timbers corresponds with the area underlain by the Antlers Formation (Figure 5.3). North of the West Fork Trinity River, the Antlers Fm. is comprised mainly of fine grained sandstones and some shales. South of the West Fork Trinity River, the correlative Twin Mountains, Glen Rose and Paluxy Fms. have more diverse lithology. The Western Cross Timbers is a rolling to deeply dissected area with sandy soils. Especially in the northern part of this area, steep canyons have been incised into the friable sandstone. Soils in the Western Cross Timbers are mainly Paleustalfs. The climax vegetation was an oak savannah (Dyksterhuis, 1946; 1948). The overstory was dominated by Post Oak (Quercus stellata) and Blackjack Oak (Q. marilandica). Trees are more common in this area today than in pre-settlement time because of fire control. Grasses and a variety of forbs constitute the understory vegetation.

The area with outcrops of Antlers Sands is a major recharge zone for the Antlers aquifer farther east. As late as the 1920's numerous artesian wells flowed from this aquifer in the Dallas-Denton area (Hill, 1901;

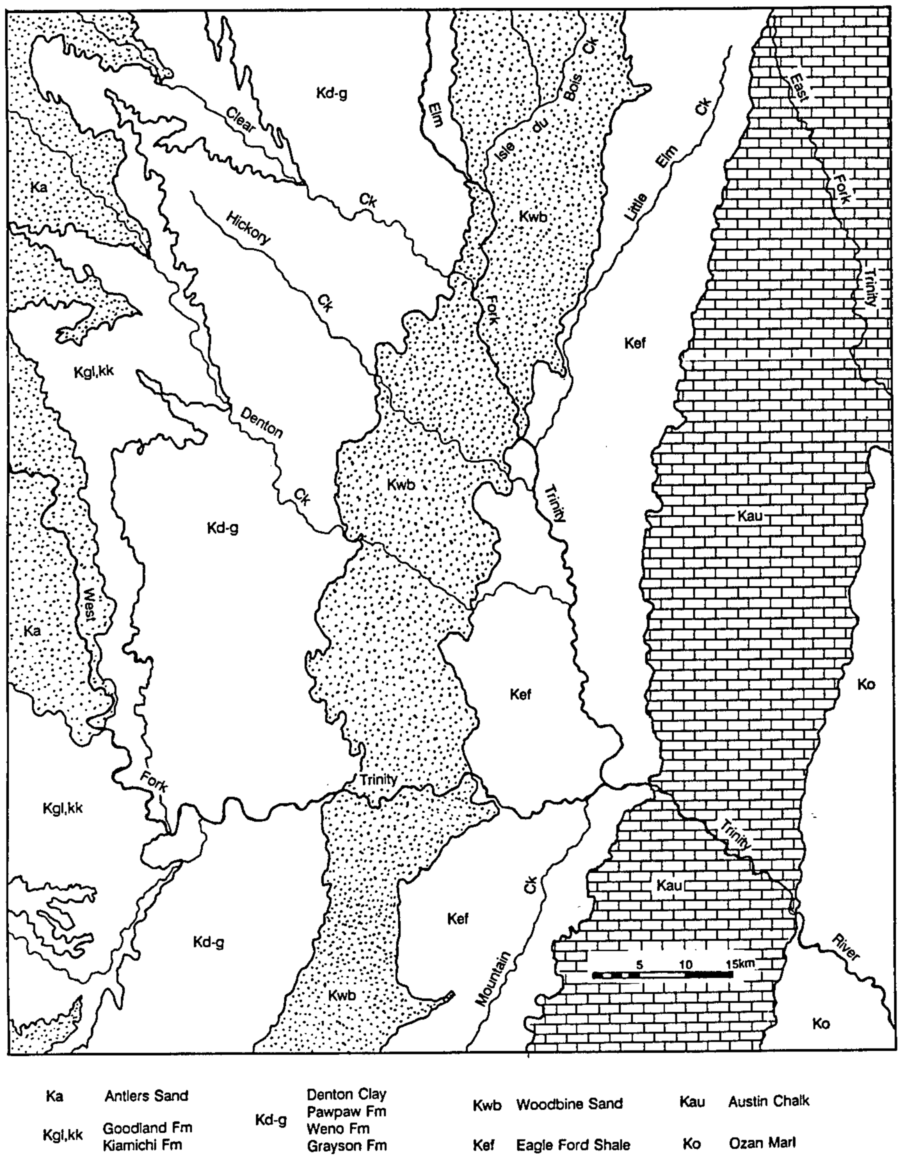


Figure 5.1 Bedrock geology of north central Texas.

Schuler, 1918). Today the Antlers remains an important aquifer in this region, although the great number of wells have stopped artesian flow.

The Fort Worth Prairie is the central portion of the Grand Prairie (Hill, 1901). The Fort Worth Prairie corresponds with the area underlain by Cretaceous limestones and marls (from the Goodland Limestone in the west to the Grayson Fm. in the east). Differences in bedrock lithology have promoted development of local differences in landforms within the Fort Worth Prairie. Overall, this subdivision is comprised of level to somewhat rolling surfaces that follow the gentle (ca. 25 feet/mile) bedrock dip to the east. Stream valleys tend to be deep and steep-sided. Soils in the Fort Worth Prairie vary according to specific bedrock parent material. Most of the upland soils are Chromusterts, Calciustolls or Haplustolls, while Paleusterts and Paleustalfs have lessor areal extent (Ford and Pauls, 1980).

Table 5.1 CRETACEOUS STRATIGRAPHY OF NORTH CENTRAL TEXAS

STRATIGRAPHIC UNIT	Thickness (feet)	LITHOLOGY
Upper Cretaceous		
Austin Chalk	400-600	massive chalk with thin marl interbeds; weathers white
Eagle Ford Group	250-350	selenitic shales with thin sandstone beds and calcareous concretions; weathers gray
Woodbine Formation	200-350	predominantly fine grained sandstones with thinner shale beds and members. Weathers red with numerous ferruginous concretions.
Lower Cretaceous		
Grayson Marl	30-60	marl and calcareous clay with few thin limestone beds. weathers yellowish brown.
Main Street Limestone	10-25	fossiliferous limestone and calcareous shale. weathers light gray to white.
Pawpaw Formation	15-50	sandstones with shale interbeds. Many ferruginous concretions. weathers brown.
Weno Limestone	60-130	marl and limestone; many concretions, fossiliferous. weathers gray.
Denton Clay	20-45	calcareous shaley clay and thin limestones; weathers brownish gray.
Fort Worth Limestone	25-35	massive and burrowed limestone with thin marl interbeds; fossiliferous, weathers yellowish brown.
Duck Creek Formation	50-100	fossiliferous limestone with thin marl interbeds. weathers yellowish brown.
Kiamichi Formation	20-50	marl and thin limestone with a few thin calcareous sandstones. weathers yellowish gray and brown.
Goodland Limestone and Walnut Clay	30-90	massive and nodular limestone with beds of marl and clay. weathers dark gray to brown.
Antlers Sand	500-650	sand, clay and conglomerate; carbonates increase to south. weathers yellowish brown.

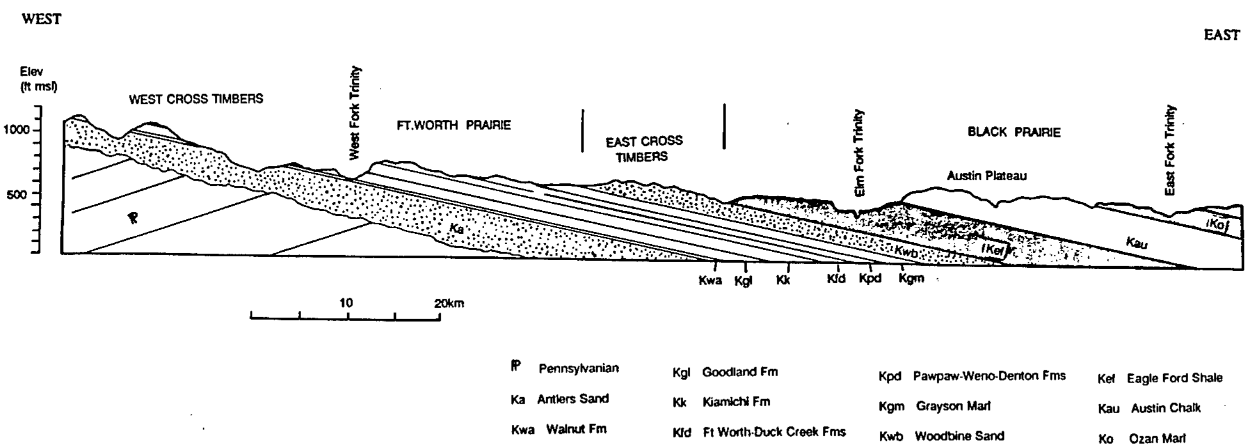


Figure 5.2 Geologic cross-section of the upper Trinity Valley.

The East Cross Timbers subdivision is a north-south belt of low hills and moderately dissected land that corresponds with outcrops of the Woodbine Sandstone. This subdivision is similar to the western Cross Timbers in that Paleustalf soils, in deep sandy parent material, are most common. Edaphic controls on vegetation are also similar, as Oak forests are main components of the climax vegetation. Because the Woodbine Fm. is thinner than the Antlers, the East Cross Timbers is narrower than the West Cross Timbers.

The Black Prairie subdivision is immediately east of the Eastern Cross Timbers, and occurs over outcrops of the Upper Cretaceous Eagle Ford Shale, Austin Chalk and Ozan Marl (Figures 5.2, 5.3). Thick calcareous and clayey soils are predominant in this subdivision, and the native vegetation was comprised of mixed grass prairies. The Austin Chalk is much more resistant to erosion than the shales and marls on either side. A result is the prominent in facing "White Rock Escarpment", a steep cuesta that overlooks the Elm Fork Trinity and Mountain Creek valleys. North and south of Dallas, the area of Austin Chalk outcrops has eroded to form a tableland blanketed by deep, black Vertisols- the Houston Black Clay soils. The more easily eroded Eagle Ford shales have been sculpted into valleys that separate the Woodbine Sandstone hills from the White Rock plateau.

In the Ray Roberts Lake area the Denton, Weno and Pawpaw Formations crop out along the western part of the lake (Figure 5.4). These are generally soft, easily eroded rocks, and are often covered by alluvium of terraces that form benches along the west side of the Elm Fork Trinity. In the central part of the project area, the Elm Fork Trinity River channel has migrated downdip in an easterly direction over Pleistocene time, with more resistant rocks of the Grayson and lower Woodbine Formations capping the bluff overlooking the Elm Fork Valley. The eastern part of the project area, along the Isle du Bois Creek drainage, has formed mainly on Woodbine Sandstone. This drainage is much broader than the deeply incised Elm Fork, and has a better developed dendritic stream pattern (Figure 5.4). The area of the Woodbine Sandstone outcrop corresponds with the Eastern Cross Timbers biotic province (Figure 5.3). Shales and marls of the Denton, Weno, PawPaw and Grayson Formations correspond with the Fort Worth Prairie. In the Ray Roberts Lake area, therefore, bedrock lithology has directly influenced development of landforms and soils as well as vegetation communities.

Drainage Systems

The West Fork Trinity River is the consequent stream of the Upper Trinity River Drainage Basin (Figure 5.5). The West Fork Trinity River headwaters are in the area of Pennsylvanian rocks west of the Pennsylvanian-

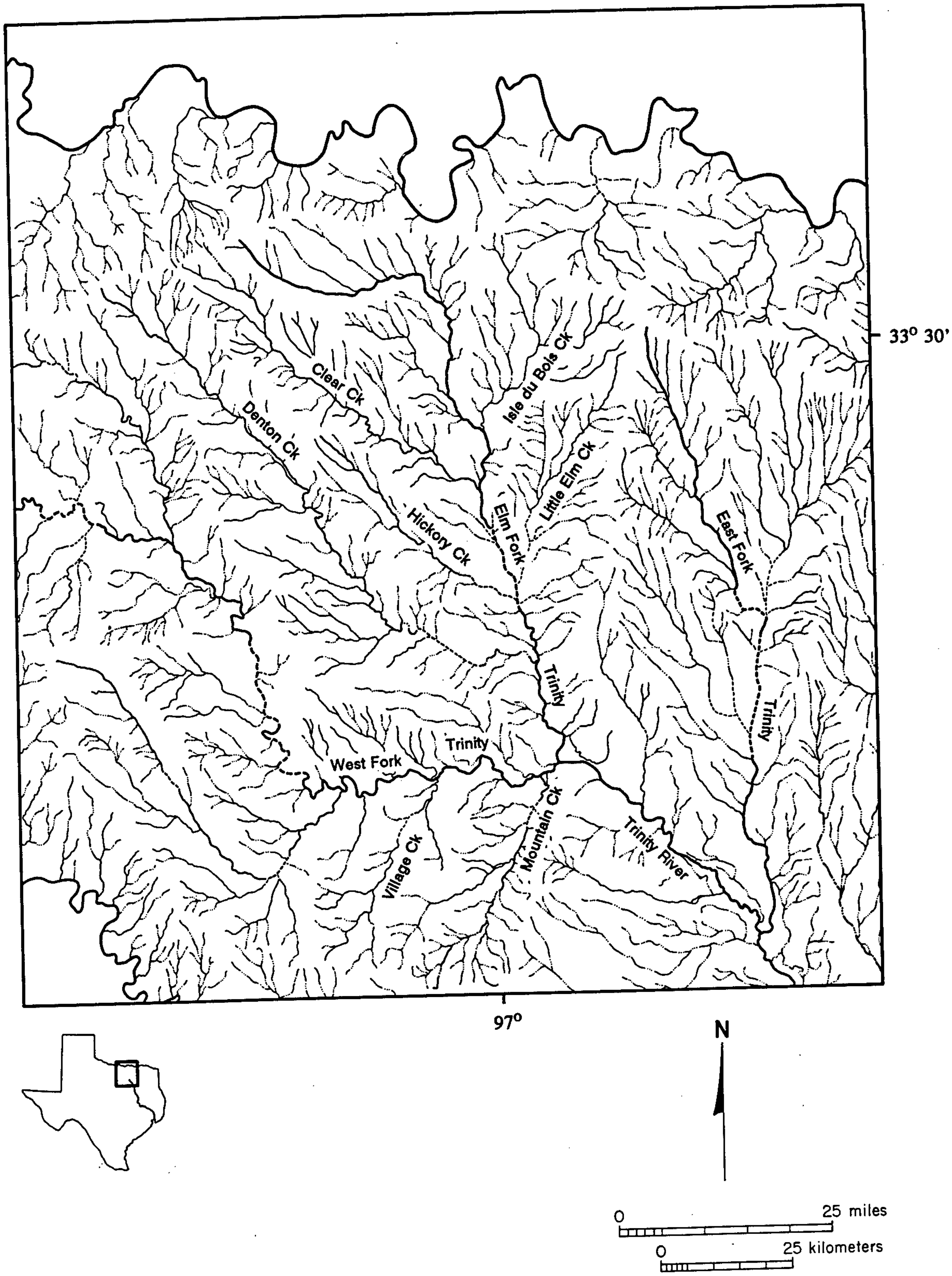


Figure 5.3 Drainage networks in north central Texas.

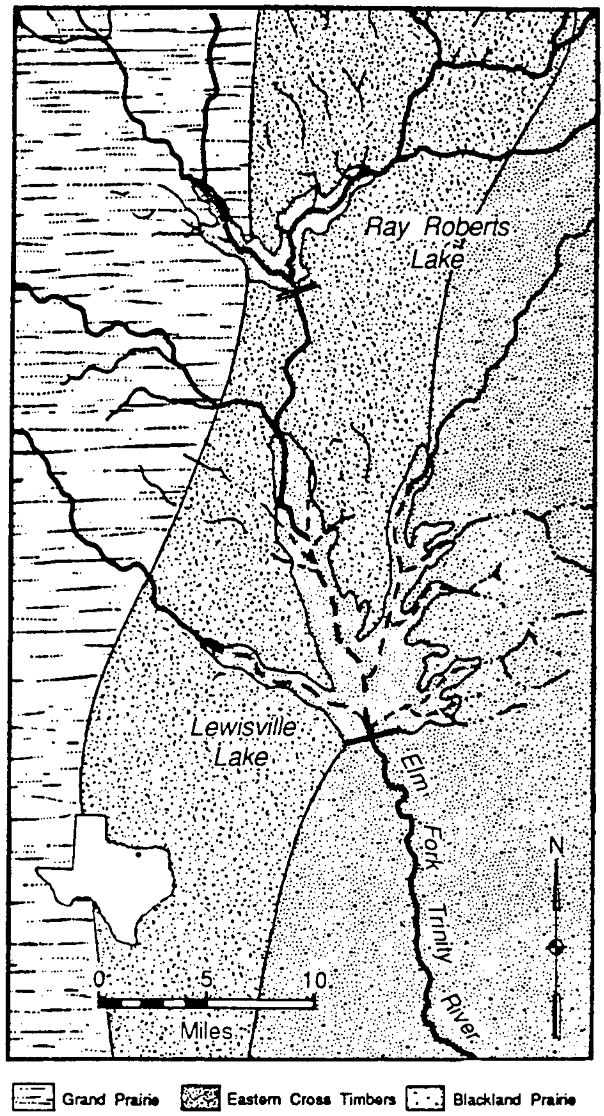


Figure 5.4 Biotic zones of north central Texas.

Cretaceous unconformity. The West Fork is superposed over the resistant Woodbine and the Austin Chalk. The Elm Fork Trinity River and Mountain Creek are subsequent drainages. Major obsequent tributaries to the Elm Fork include Clear Creek, Hickory Creek and Denton Creek. These drainages all follow regional bedrock dip, and have elongated dendritic patterns (Figure 5.5). Shorter, steep resequent streams flow off the western slope of the Austin Chalk escarpment.

The marked asymmetry of the major streams in the Ray Roberts Lake area is the result of differential resistance of bedrock (Figure 5.3). The Elm Fork Trinity Valley is narrow and topographically asymmetric in cross-section; it has a series of alluvial benches above the river to the west, and a bedrock scarp on the east. In contrast, the Isle du Bois drainage is broad, roughly symmetric and has more gentle slopes than the Elm Fork valley.

Because of different bedrock lithologies in the Elm Fork and Isle du Bois drainages, alluvial sediments along these streams are very different. The Holocene alluvium along the Elm Fork is clay and silt, while sands are dominant in the Holocene alluvium of the Isle du Bois. These differences have important consequences in terms of site formation processes, as discussed later in this report. It is likely that these differences in sediments also influenced vegetation patterns along flood plains during the Holocene. Low sandy terraces along the Isle du Bois were probably better drained, and probably supported more Oaks in the riparian galleries. Clayey, calcareous soils along the Elm Fork probably supported a richer undergrowth and fewer oaks. Proximity of prairie habitats west of the Elm Fork probably had an important effect on resource procurement for sites in that drainage, in contrast to the Isle du Bois drainage.

Climate

This part of Texas has a humid, subtropical climate. Summers are hot and winters are mild except for brief periods of cold temperatures associated with arctic fronts called "northers". Precipitation and temperature data (1931-1969) show that late spring and early fall are the wettest months, while summer temperatures are high and rainfall is low (Figure 5.6). Occasionally, tropical storms reach this area causing severe flooding. Normal overbank flooding is common in the spring months when Pacific air masses collide with warm Gulf air.

Average rainfall in Denton County is 813 mm/yr (32 in/yr) (Ford and Pauls, 1980) and the region is ecotonal between the Prairie Plains to the west and the pine-broadleaf forests in east Texas. Because of the moderate climate, edaphic controls on vegetational patterns are distinct. Limestones and marls with calcareous soils support prairie ecosystems, while oak savannas (the "Cross Timbers") occur in areas underlain by sandstones. Indeed, a characteristic of this region is its mosaic of soils; calcic Mollisols and Vertisols are associated with calcareous bedrock and alluvium, while Alfisols are associated with sandstone bedrock and sandy alluvium.

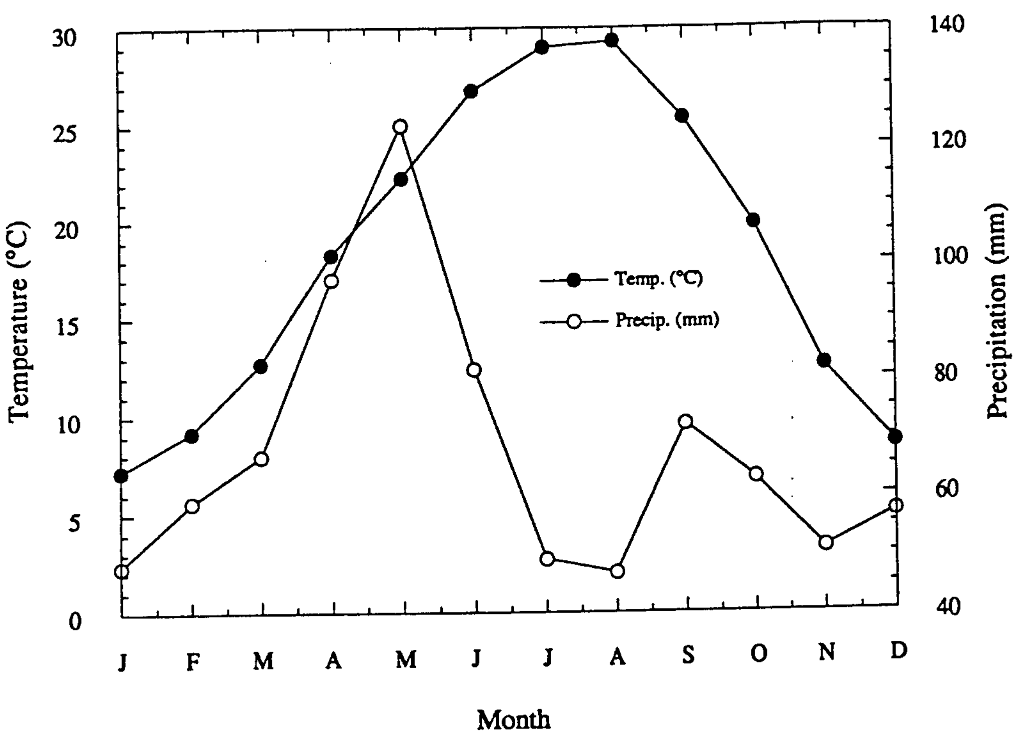


Figure 5.5 Temperature and precipitation in Denton County (1939-1989) (From Ford and Pauls, 1980).

Biotic Resources

The biotic resources in this part of Texas must be considered at several scales for defining contexts of prehistoric archaeological sites. On a local scale, drainages, landforms and soil types probably were important in defining loci for occupation or resource exploitation activities. This scale is evident within the project area. At a regional scale, major environmental zones, such as the Cross Timbers or Fort Worth Prairie, probably conditioned patterns of periodic or seasonal movements and were important factors in determining multisite locational patterns. At a still larger scale, the Upper Trinity basin is situated at a boundary between major physiographic provinces (the Gulf Coastal Plain and the Southern Plains), and near a major regional drainage, the Red River. With respect to interpreting the prehistoric archaeological record at Ray Roberts Lake, we will focus on the smaller scale ecological parameters, but will later consider the regional position of the project area with respect to broader or diachronic patterns of archaeological variability.

Lake Ray Roberts lies within Dice's (1943) Texan bioticprovince. It is a discrete geographical area within which distinct plant and animal communities, reaching their eastern and western extremes, overlap (Blair 1950; Webb 1950). It is a diverse area where the flora and fauna of three distinct ecological zones, the eastern woodlands, the prairies, and riparian stream courses, occupy a patchy mosaic.

The predominately clayey soils of the prairies support tall to mid-size grasses with scattered oak trees in the uplands and fingers of riparian communities along stream courses. By contrast, the Eastern Cross Timbers consists of sandy upland soils supporting dense groves of post oaks and greenbriar with an understory of big and little bluestem, switchgrass, lovegrass, and many kinds of forbs and legumes. On the floodplains in the Cross Timbers, overstory vegetation consists of elms, pecans, oaks, cottonwoods, and willows as part of the riparian assemblage; understory vegetation includes various frutescents as supplements to a rich variety of mast-producing trees, thus providing various fruits, such as plums and berries, and nuts. Vegetation along the stream courses within the prairie zones functions as riparian habitat and consists of virtually the same overstory species as found in the temperate woodlands of the Cross Timbers (Dyksterhuis 1946, 1948; Hill 1901; Urbanovsky 1972). These bottomlands were probably the most significant part of the entire region in terms of the exploitative strategy of prehistoric peoples (Lynott 1977). Most large game species would have concentrated in greater numbers within the bottomland forest zone. This would have been especially true during fall and winter when acorns ripen and fall and when some late fruits like persimmons finally ripen. The bottomlands supported a great variety of resources, including the all-important deer, raccoon, opossum, rabbit, squirrel, and wild turkey. Seasonal resources include migratory birds, especially waterfowl which feed along aquatic margins, spawning fishes, most amphibians and reptiles, which are more active in warmer seasons, floral products (berries, fruits, and nuts), and insects (Marmaduke 1975; McCormick et al. 1975; Shaw 1978).

Other animals represented archaeologically in the area include pronghorn, cottontail, jackrabbit, cotton rat, beaver, dog, coyote, wolf, badger, birds, lizards, terrestrial and aquatic turtles, and a great variety of birds. In all, at least 49 species of mammals, 39 species of reptiles, 20 species of amphibians, and 239 species of birds are found today in the project area (Blair 1950; Coster et al. 1972).

Dyksterhuis (1948:327) recounts the origin of the name "Cross Timbers" as unrecorded but "presumably alludes either to the fact that this forest extends north and south across, rather than along, the major streams all of which flow eastward"; he further notes that the Indians and trappers used it as a landmark when they wished to sketch their expeditions, by first drawing a vertical line to represent the forest, then an intersecting one to indicate the route.

Nineteenth-century travelers through this part of Texas provide eyewitness accounts to what the landscape might have looked like at least toward the end of the late prehistoric period. Kendall (1845:115) reported that the sojourners could expect the Cross Timbers to be "a singular strip of wooded country [with] an almost impenetrable undergrowth of brier."

He went on to describe what the environment had to offer:

> Here and there he will also find a small valley where the timber is large and the land rich and fertile, and occasionally a small prairie intervenes; but the general face of the country is broken and hilly, and the soil thin. On the eastern side of the Cross Timbers the country is varied by small prairies and clumps of woodland, while on the western all is a perfect ocean of prairie. . . . In the Cross Timbers, we found the face of the country broken, and full of deep and almost impassable gullies. These, in the rainy season, carry off the waters from the hills to the larger streams outside the woods, but in July we found them all dry. . . .
>
> Bear and deer are found in the Cross Timbers and the vicinity, and small gangs of buffalo take shelter in them when scattered and driven from the prairies by Indians. (Kendall 1845:115-119)

Evidence of bison is found at a few prehistoric sites. The tall and mixed grass prairies probably did not support large herds of bison or pronghorn, which prefer short grass prairies found farther west and south, but the area would at least have supported smaller herds. Hornaday (1887:426) lists several grasses consumed by bison, but the only one listed that grows this far east is little bluestem (Andropogon scoparius) (Dysterhuis (1946), which could have supported small groups. Most importantly, the stream courses would have attracted straggling migrants into the area; and it is in the riparian sites that evidence of bison is seen prehistorically. Buffalo were hunted well into the settlement period. They were numerous in the 1830s but were essentially extirpated before the mid-1840s.

Early settlers in Denton County reported that wild game was plentiful, including prairie chickens, quail, turkey, ducks, geese, beaver, deer, and antelope. Less numerous, if ever seen, were "ground hogs," which were probably mistaken as prairie dogs (Cynomys ludovicianus) (Bridges 1978:36).

Table 5.2 lists all of the faunas represented in the prehistoric archaeological assemblages under the present study. They are organized by vertebrate class, and notation is made of the habitat preference of each. Cases where uncertainty of the taxonomic identification exists are indicated appropriately.

Table 5.2 Identified Genera and Species at Ray Roberts Lake

taxon	habitat
Osteichthyes - Bony Fish	
Lepisosteus spp. (Gar)	A
Amia calva (Bowfin)	A
Ictalurus punctatus (Channel Catfish)	A
Ictalurus spp. (Catfish)	A
cf. Lepomis spp. (?Sunfish)	A
Aplodinotus grunniens (Freshwater Drum)	A
Amphibia - Amphibians	
Ambystoma sp. (Mole Salamander)	V
cf. Bufo woodhousei woodhousei (?Woodhouse's Toad)	B
cf. Scaphiopus sp. (?Spadefoot Toads)	G, W
Rana catesbeiana (Bullfrog)	A
Reptilia - Reptiles	
Chelydra serpentina (Snapping Turtle)	A
Macroclemys temmincki (Alligator Snapping Turtle)	A

Table 5.2, cont.

Sternotherus spp. (Musk Turtles)	A
Kinosternon spp. (Mud Turtles)	A
Terrapene spp. (Box Turtles)	G, W
Graptemys sp. (Map Turtle)	A
Chrysemys scripta elegans (Red-eared Turtle)	A
Chrysemys spp. (Basking Turtles)	A
Trionyx spp. (Softshell Turtles)	A
Phrynosoma cornutum (Texas Horned Lizard)	G
Sceloporus olivaceus (Texas Spiny Lizard)	W
cf. Cnemidophorus gularis gularis (?Texas Spotted Whiptail)	G
cf. Cnemidophorus sp. (?Whiptail)	G
cf. Thamnophis proximus proximus (?Western Ribbon Snake)	B
Elaphe sp. (Rat Snake)	V
Aves - Birds	
Buteo jamaicensis (Red-tailed Hawk)	G, WE
Tympanuchus sp. (Prairie Chicken)	G
Colinus virginianus (Bobwhite)	G, WE
Meleagris gallopavo (Wild Turkey)	W, WE
Fulica americana (American Coot)	A
Sturnella sp. (Meadowlark)	G
Cardinalis cardinalis (Cardinal)	WE
Mammalia - Mammals	
Didelphis virginiana (Oppossum)	B, W
Scalopus aquaticus (Eastern Mole)	W
Dasypus novemcinctus (Nine-banded Armadillo)	W
Sylvilagus floridanus (Eastern Cottontail)	W, WE
Sylvilagus aquaticus (Swamp Rabbit)	B
Lepus californicus (Black-tailed Jack Rabbit)	G
Spermophilus tridecemlineatus (Thirteen-lined Ground Squirrel)	G
Sciurus niger (Fox Squirrel)	W, B
Sciurus carolinensis (Gray Squirrel)	B
Geomys bursarius (Plains Pocket Gopher)	G
Perognathus sp. (Pocket Mouse)	G
Castor canadensis (Beaver)	A
Reithrodontomys sp. (Harvest Mouse)	G
Peromyscus spp. (White-footed Mice)	V
cf. Baiomys taylori (?Northern Pygmy Mouse)	G
Onychomys leucogaster (Northern Grasshopper Mouse)	G
Sigmodon hispidus (Hispid Cotton Rat)	G
Neotoma sp. (Woodrat)	B, W
cf. Microtus ochrogaster (?Prairie Vole)	G
Microtus spp. (Voles)	W, G
Canis sp. (Coyote, Dog, and Wolf)	V
Vulpes vulpes (Red Fox) and/or	WE, B
Urocyon cinereoargenteus (Gray Fox)	W, WE
Procyon lotor (Raccoon)	B, W
Mustela vison (Mink)	B
Taxidea taxus (Badger)	G
Mephitis mephitis (Striped Skunk)	WE

Table 5.2, cont.

Odocoileus virginianus (White-tailed Deer)	WE
Antilocapra americana (Pronghorn)	G
Bison bison (Bison)	G

Key:

A = aquatic (rivers, swamps, marshes)
G = grasslands (brush, prairies)
W = woodlands (deciduous or pine forests)
B = bottomlands (riparian habitats)
V = various (more than one habitat)
WE = wooded edges (open meadows, parkland)

Shellfish constitute another faunal resource found in large amounts at some of the archaeological sites. Read (1954) has recorded 30 species of unionids in Dallas County to the south, and he credits the various kinds of stream bottoms in the Trinity River watershed to this diversity. Short-term dry periods throughout the year would create low water levels at which times shellfish could be collected from pools in the creek beds (Lynott 1977:36).

In summary, Lake Ray Roberts is a broadly ecotonal area, where distinct ecological communities converge. The area is comprised of grassland, forest, and riparian habitats, which maintain diverse fauna and flora from biotic regions to the east and west.

Lithic Resources

Definition of lithic resources is an essential aspect of analysis of prehistoric sites because the durability of lithic artifacts ensures that they can be used to infer patterns of raw material selection, procurement and processing. The North Central Texas region is notable for its paucity of knappable lithic raw materials (Banks 1990). For purposes of assemblage analysis, it is possible to define lithic resources in three categories: local, regional and exotic. Local resources are those that are available within the project area, and therefore within easy walking distance of sites. Regional sources are those that are not within the project area, but are within the North Central Texas region. Exotic resources are those that occur naturally outside the region.

Local resources are limited in terms of petrology. These include: a) remnant deposits of Ogallala metaquartzite, quartzite and fossil wood that derive from remnants of Tertiary gravels; b) ferrocrete sandstones that derive from deeply weathered soil horizons in the Woodbine Sandstone and c) local sandstones and limestones that were usually used for grinding stones or hearth stones. Despite the fact that these lithic resources are "local", geologic surveys indicate that their specific sources are not areally uniform. Small cobbles of Ogallala quartzite may be found in most alluvial gravels, especially those associated with terraces. One outcrop of large boulders (up to 25 cm) of fine-grained Ogallala quartzite was found in channel deposits of probable Tertiary to early Pleistocene age on hill tops and high slopes along Isle du Bois Creek. These large cobbles and boulders could have been a "quarry source" for Ogallala raw materials that may have been specifically exploited.

Regional resources include raw materials of "local" types, but also include cherts and orthoquartzites that occur in Pennsylvanian rocks west of the project area and also occur in gravels of the West Fork Trinity, Denton Creek and Clear Creek. The cherts are varied, including many colors of cryptocrystalline chert and fossiliferous chert. In the Ray Roberts assemblages, the vast majority of "cherts" are regional cherts, and most evidence (especially cortex type) points to gravel sources for these materials. Some of the quartzites are distinct from "Ogallala" in that they contain multicolored chert and quartz grains. Many of the "regional" cherts are difficult to distinguish from Edwards chert from central Texas (Banks, 1990). Procurement of regional cherts implies a greater exploitative area than use of local materials, but not necessarily trade or exchange.

Exotic resources include a variety of materials that are distinctive as to petrology and source. These are very rare in assemblages from Ray Roberts Lake, and mainly include Edwards chert. Individual types are mentioned within site discussions. Use of exotic materials implies but does not confirm procurement via trade or exchange.

CHAPTER 6
LATE QUATERNARY GEOLOGY

Considerable progress has been made in defining morphostratigraphic and allostratigraphic units in the Upper Trinity River Drainage Basin in the past five years. The majority of this research has been sponsored by the Ft. Worth District, including research at Ray Roberts Lake and Lewisville Lake. The following summary is developed from that research, and provides a contextual basis for geoarchaeological analyses at Ray Roberts Lake prehistoric sites.

Alluvial Stratigraphy and Geochronology

Analysis of borehole data, description of sections exposed in channel cuts and gravel pits, and excavation of backhoe trenches and archaeological profiles have been used to define the lithostratigraphic units. A significant increase in the number of radiocarbon ages has also been realized through recent research. The stratigraphic units described below include some that were formally or informally defined earlier (Ferring, 1990b, 1993). The stratigraphy is first arranged according to morphostratigraphic units (terraces and floodplain), then by alluvial units within each morphostratigraphic unit (Figure 6.1).

Stewart Creek Terraces

Along the Elm Fork and West Fork Trinity are discontinuous and dissected terraces that are higher than the Hickory Creek Terrace (Figure 6.1). These were called Marsalis by Taggart (1953) and a variety of names (eg. Buckner Home, Hackberry Creek, Travis School) by Crook and Harris (Slaughter et al., 1962). They were called "high terraces" by Ferring (1986d; 1990b). As informally defined here, the Stewart Creek terraces include strath surfaces with veneers of quartzite and metamorphic cobbles (Menzer and Slaughter, 1971), as well as terrace remnants underlain by alluvium. Alluvial fill of some of these terraces has been initially studied at an exposure in Irving, and is described in borehole logs for Lewisville Dam (Ferring, 1986c). At both of these localities the terrace surface is approximately 105 feet above the Elm Fork Trinity flood plain. It is probable that more than one terrace occurs above the Hickory Creek, yet substantial work is needed to define these.

The age of the Stewart Creek terraces is not known, but based on geomorphic position and soil development these surfaces appear to be at least middle Pleistocene. In the Ray Roberts Lake area Stewarts Creek Terraces are mainly straths at higher elevations (Figure 5.4). These contain lags of Ogallala quartzite, and are marked by very strongly developed soil in bedrock. Elsewhere the alluvium associated with these terraces is informally designated as the Irving alluvium.

Irving alluvium. This unit is informally defined as the alluvium that occurs between bedrock benches and the surface of the Stewart Creek terraces. Borehole logs and quarry exposures show this alluvium to be heterogeneous. At an exposure in Irving, this unit includes matrix supported pebble and cobble gravel overlain by at least 5 m of yellowish brown loamy alluvium. A strongly developed Alfisol with a thick red argillic horizon has formed at the surface of the alluvial parent material. Borehole data from the Lewisville Lake Dam show that 7-8m of Irving alluvium below the surface of the Stewart Creek terrace is dominated by silts and clays, with thin sand and gravel near the base of the section (Figure 6.1).

Hickory Creek Terrace

This terrace was formally defined by Ferring (1991). The Hickory Creek Terrace is the most clearly expressed terrace along the Elm Fork Trinity Valley. It is a broad, very flat terrace that is frequently matched on both sides of the valley. The terrace is less dissected than the sandier terraces above and below. It has been mapped from Valley View, Texas to south of Dallas, a distance of over 60 miles (100km). The same terrace can be traced up larger tributaries of the Trinity; broad exposures are present along Ten Mile Creek, Mountain Creek, Denton Creek, Hickory Creek, Clear Creek and Isle du Bois Creek (Figure 5.5). The Hickory Creek Terrace is almost always broader on the west or north sides of these tributaries. Despite its generally clear

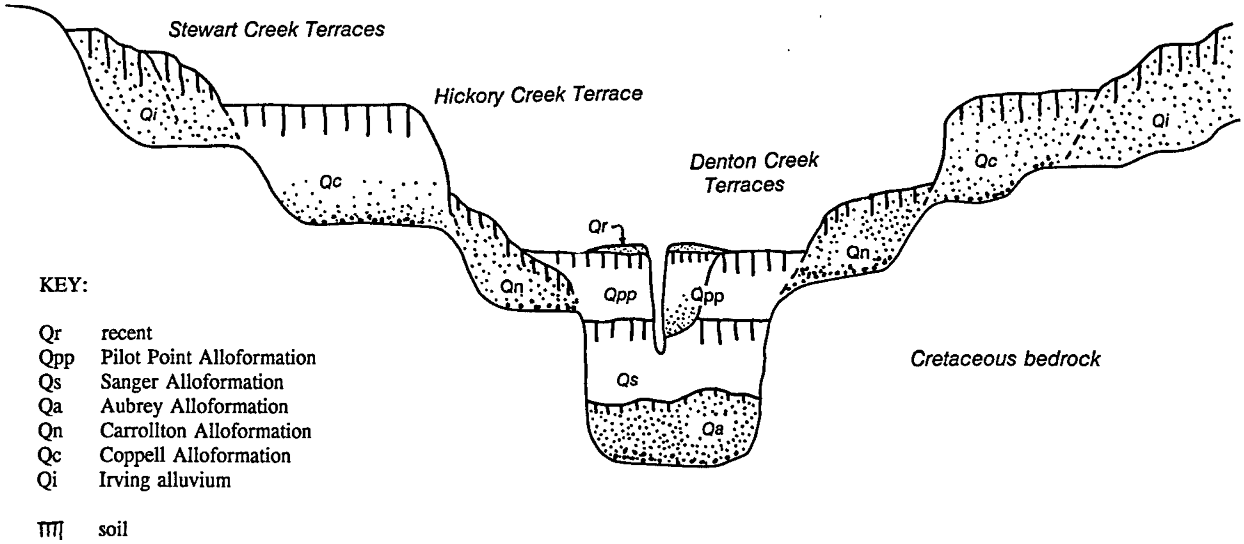


Figure 6.1 Schematic geologic cross-section of the upper Trinity River Valley.

geomorphic expression this terrace is difficult to find in the confusing array of older terrace nomenclature.

Both Shuler (1935) and Taggart (1953) identified this as the Love Field terrace at Dallas, and Taggart did a good job of mapping the terrace upstream. The Hickory Creek Terrace is the same as Crook's Lewisville ("T2") at Lewisville (Crook and Harris, 1957), yet he incorrectly placed that terrace below his Love Field ("T4") and his Travis School ("T3") at Dallas.

Two alluvial units have thus far been defined as part of the alluvial fill of the Hickory Creek Terrace. No prehistoric sites associated with this terrace were studied at Ray Roberts Lake, although a number of historic sites occur on this surface.

Coppell Alluvium. The type section for the Coppell Alluvium is located in a gravel pit east of Valley View, Texas (Ferring, 1990b). This section (Profile 922B) is a few hundred meters west of site 41CO150. The base of the unit is bedrock and the upper boundary is the surface of the Hickory Creek Terrace. At the type section, and in most other localities, the Coppell Alluvium has gravel and/or sand in the lower part of the section. The gravel is matrix or clast supported pebbles and cobbles that are sometimes cemented by calcite or hematite. Clasts are mainly limestone rock fragments, rolled Cretaceous megafossils and rolled hematite/limonite concretions. The gravel and sand are overlain by calcareous clay loam and silty clay loam that comprise most of the section. Pedogenic and probable groundwater carbonate concretions are common in the section, below the leached soil horizons at the surface. A strongly developed Mollisol or Vertisol has formed at the surface in the fine-grained parent material. Pleistocene vertebrate and invertebrate fossils are common, especially in the middle and lower parts of the sections.

The Coppell Alluvium occurs as fill of the Hickory Creek Terrace along reaches of the Elm Fork and West Fork Trinity that received calcareous, fine-grained alluvial sediments. These deposits appear sandier south of the confluence with the West Fork Trinity, which has appreciable sandy bedload. Other sections of Coppell alluvium in the Ray Roberts Lake area include those at sites 41DN91 (Figure 5.4) and 41DN466. Along Isle du Bois Valley, the Coppell alluvium is much sandier than along the Elm Fork Trinity.

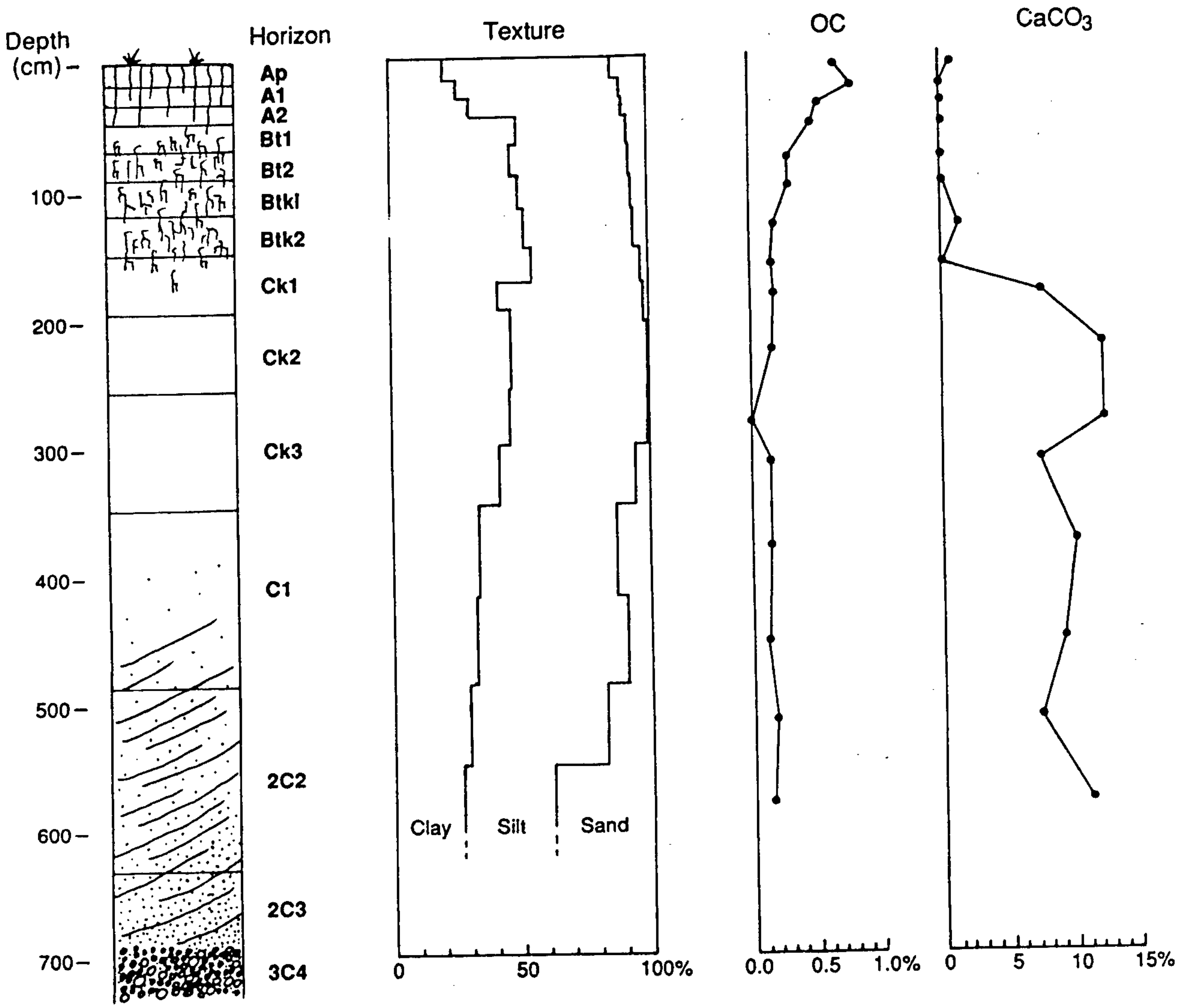


Figure 6.2 Geologic section of Locality 922B. Section is on Elm Fork of the Trinity, east of Valley View.

The Coppell Alluvium is considered to be early to middle Wisconsin in age (Oxygen isotope Stages 5a to 3/4). Geomorphic and sedimentary data suggest that the Hickory Creek Terrace formed over a very long interval. The upstream sections, on Clear Creek and on the Elm Fork near Valley View (Figure 6.2) show that the channel bases were on bedrock. Thus, the upstream sections of Coppell Alluvium appear to reflect headward growth of the valley and upstream construction of the Hickory Creek flood plain. In the Lewisville-Dallas area, the extremely broad Hickory Creek Terrace is evidence for prolonged flood plain widening during the course of Coppell aggradation.

Faunal data also suggest a prolonged period of alluvial deposition. Faunas from the Coppell-Tioga alluvium were initially considered to be Sangamon in age (Slaughter et al., 1962). A Wisconsin age was suggested by Hibbard (1970), and Slaughter (1966) later noted ecological variability among the faunas suggesting that the younger Moore Pit faunas were of Wisconsin age. Slaughter (1966) also noted similarities between the Clear Creek local fauna and the upper Moore Pit faunas from near Dallas. While it may not be possible to seriate these faunas taxonomically, the patterns of ecological variability noted by Slaughter are most easily explained by reference to the geomorphic-sedimentary genesis of the Hickory Creek terrace and Coppell Alluvium. It appears that the early Coppell Alluvium occurs in downstream settings, below younger Coppell Alluvium. The earlier Coppell Alluvium contains Rancholabrean vertebrate faunas indicative of moist climates. The younger Coppell Alluvium is present in two settings: a) stratified above the younger Coppell in downstream settings, and b) as the complete Coppell sections in upstream settings. The younger Coppell Alluvium has yielded faunas indicative of climatic conditions drier than those of early Coppell time.

The early Coppell Alluvium probably dates to early to middle Wisconsin (Slaughter, 1966; Slaughter and Ritchie, 1963; Cheatum and Allen, 1963; Holman, 1963). The late Coppell Alluvium most reasonably dates to the middle Wisconsin (Isotope Stage 3 or 4). Correlatives of the Hickory Creek Terrace and Coppell Alluvium include the "T2" along the East Fork Trinity River, with faunas similar to the Moore Pit Fauna (Thurmond, 1967) and the Trinity terrace and Wisconsin faunas south of Dallas near Trinidad, Texas (Stovall and McAnulty, 1950).

While the single radiocarbon age from the younger Coppell Alluvium, from the Clear Creek locality, should be suspect, the age (28,840 +/- 4,740) may not be unreasonable. This age should be checked by additional radiometric dating, including Uranium series or ESR, but also by further attempts to date the younger Coppell Alluvium with radiocarbon methods. In any event, it is probable that the Hickory Creek Terrace morphogenesis progressed for as much as 30-40,000 years, and abandonment of the Hickory Creek floodplain probably occurred ca. 30-40 ka.

Denton Creek Terraces

Below the Hickory Creek Terrace are a series of discontinuous surfaces that are between 10-50 feet above the flood plain. Despite mapping by Taggart (1953), these surfaces are difficult to trace downstream. Matched benches are rarely observed, and sloping surfaces are characteristic (Ferring, 1986c). Some of these surfaces mapped by Taggart as Union Terminal or Carrollton terraces are clearly toe slopes of the Hickory Creek Terrace. In some places these surfaces appear to be cut terraces on the lower part of the alluvial fill of the Hickory Creek Terrace; in others, a fill terrace is documented by borehole data (Ferring, 1986c). Investigation of "Carrollton" terraces in northern Dallas County revealed late Holocene alluvium overlying truncated older alluvium that is probably late Pleistocene (Ferring, 1986c). Substantial discharge from Denton Creek complicates reconstructing depositional histories in this part of the valley, and more work needs to be done on the broad, low surfaces that Taggart (1953) mapped as the "Carrollton Terrace".

In the Ray Roberts Lake area, Denton Creek terraces are discontinuously present along the Elm Fork Trinity, but are quite continuous along Isle du Bois Creek. In both cases they have been eroded and often slope toward the valley axis. Sections of Denton Creek terrace have been described near 41CO150 (Profile 922A), and at sites 41DN79, 41DN99 and 41DN346. These are the settings for "terrace sites" described in Section III of this report.

The fill of the Denton Creek terraces (Carrollton alluvium) is always sandy to loamy. As a result, the terrace surfaces are quite dissected; eroded, sloping surfaces are common.

Carrollton alluvium (late Pleistocene). This informal alluvial unit was defined as the fill of the Denton Creek terraces (Ferring, 1990b). The lower boundary of the unit is a bedrock bench that may be above or below the elevation of the present flood plain. The upper boundary is either a) the surface of a Denton Creek terrace, or b) clayey recent alluvium where the upper surface (either a buried soil or a truncated section of alluvium) of the Carrollton alluvium is below the present flood plain. In the sections that are bounded by terrace surfaces above the flood plains, the Carrollton alluvium is almost always sandy to loamy. It is usually non-calcareous. In the buried sections it is either sandy or has gravel and sand overlain by fining upward loamy alluvium that is sometimes but not usually calcareous. Moderately developed soils occur at the top of the alluvium unless the section has been truncated by erosion. At localities near Dallas, the Carrollton alluvium contains vertebrate and invertebrate megafossils of Pleistocene age (Willimon, 1972), but paleontologic data from this alluvial unit are scarce.

The maximum age of the Carrollton alluvium can be fixed only as roughly as the minimum age of the Coppell Alluvium. Willimon's (1972) radiocarbon ages on the geomorphically lowest Carrollton alluvium appear consistent and reasonable. The late Rancholabrean fauna from Willimon's localities, including Bison antiquus, is consistent with his radiocarbon ages. The vertebrate and invertebrate faunas from Willimon's Carrollton alluvium are indicative of cooler and moister climates than those of the earlier Coppell Alluvium. He proposed that there were diminished seasonal temperature extremes compared to today's climate, and also greater stream discharge.

The last phase of valley incision into bedrock is bracketed by radiocarbon ages between ca. 21 ka and ca. 15 ka. As postulated earlier (Ferring, 1986 c,d), this maximum valley entrenchment coincides with the last glacial maximum. Because this was a non-glaciated region, and because of the considerable distance to the Gulf of Mexico, climatic factors are probably the explanation for this incision. Tectonic or eustatic controls cannot be dismissed, but there is no evidence as yet that they were causal factors in this profound geomorphic change. Considering that a very long phase of upstream flood plain growth and downstream valley widening and aggradation (ie. the Hickory Creek morphogenesis) preceded this phase of incision, geomorphic instability must have contributed to the magnitude of the response to a presumed change in climate.

Floodplain

As was described by early explorers of this region, the floodplains of the Trinity and its larger tributaries are broad and exceptionally flat. Depositional geomorphic features such as oxbows or abandoned reaches of meanderbelts are uncommon. Low alluvial ridges and low silty levees occur along the present channels of the Elm Fork Trinity and West Fork Trinity.

The channels of the Trinity are narrow and deep. North of Denton, channels average 7-8 m in depth and are usually between 10-15 m wide. Below Dallas, channels are narrow and approximately 11 m deep. Near Fort Worth, on the West Fork Trinity River, channels are approximately 9 m deep and very narrow. Radiocarbon ages from a number of localities (eg. 41CO141) indicate that during the Late Holocene, channels were about as deep as they are today.

Because of associated archaeological materials, a number of sections of sediments below the floodplain were described and studied at Ray Roberts Lake. Especially important in this regard is the Aubrey Clovis Site (Ferring 1989, 1990a). Although this site will be described in a separate report, geologic and paleoenvironmental data will be briefly described in this report to better establish the contexts of other Holocene localities at Ray Roberts Lake. The following discussion of late Pleistocene and Holocene alluvial units refers to several that have type sections at the Aubrey Site (Figure 6.3).

Aubrey Alluvium (terminal Pleistocene). This alluvial unit is defined as gravel and sand with occasional beds of finer alluvium, marls or lacustrine sediment, that occur below floodplains (Ferring 1993). The lower boundary of the unit is the deepest bedrock surface below the floodplain. The upper boundary is the contact with the Sanger Alluvium. This boundary is marked by an erosional disconformity with a marked textural change to finer overlying alluvium, and a weakly developed soil. The Aubrey Alluvium is between 6-8m thick.

Between ca. 14 ka and 11 ka there was apparently no significant geomorphic change in the Trinity River Valley. This conclusion is made on the basis of data from the Aubrey Clovis Site, which is an admittedly singular but nonetheless strong basis for the conclusion. The spring pool at the site filled with marl and peat between ca. 14-11 ka. The pond was at the level of the flood plain during this interval, yet only trivial alluvium was deposited, and no erosional disconformity is present. A steep slope remained stable above the pond during this interval, and only just before 11 ka is there evidence for colluvial deposition in the pond depression.

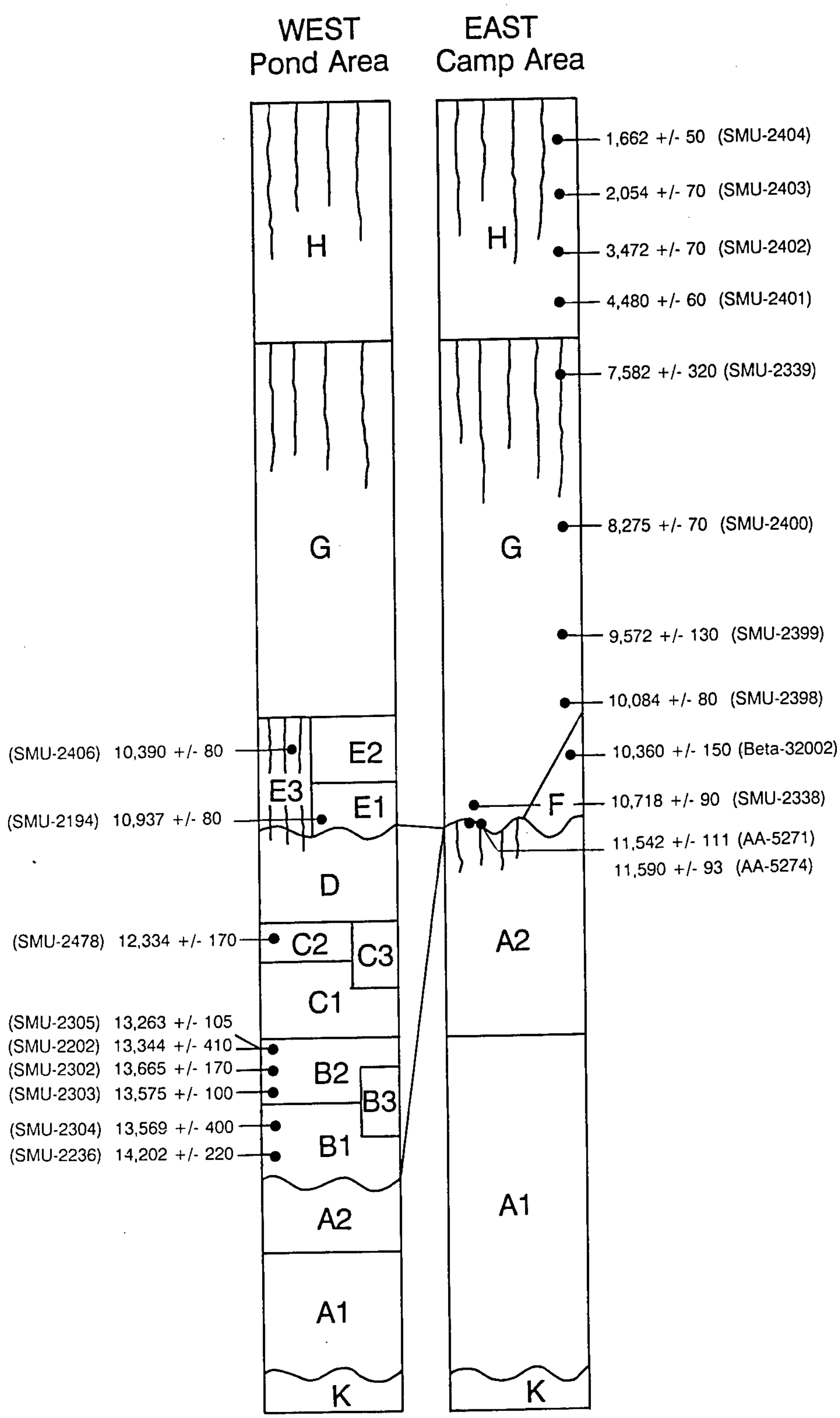


Figure 6.3 Stratigraphic columns and radiocarbon ages from the Aubrey Clovis Site.

Immediately after 11 ka, rapid alluviation began the Holocene phase of valley filling. Borehole data preclude the possibility that continued channel entrenchment into bedrock took place between 15-11 ka.

Although spring activity was essentially continuous during this interval, the recharge area for the springs in this area is large, and supported numerous artesian springs and wells up until this century (Hill, 1901; Shuler, 1918). Spring activity, and therefore aquifer recharge are assumed to have been diminished. Reduced seasonality, the lack of convectional storms (associated with disrupted airmass circulation) and/or equitable distribution of rainfall could account for the lack of flooding, but probably not the low spring discharge. At present, therefore, geologic data suggest an interval of dry if not arid climate. Biotic data from the Aubrey site will soon be synthesized to more firmly assess local terminal Pleistocene environments.

Sanger alluvium (Early Holocene: 11-7.5 ka). Relatively rapid valley alluviation took place in the early Holocene, as shown by radiocarbon ages and soils data from the Sanger alluvium (Figure 6.3). Data from the Aubrey site show that this alluviation began very soon after Clovis occupations, ca. 11 ka, and continued until ca. 7.5 ka. Early Holocene channel facies were dated at the Gateway locality near Fort Worth (Ferring, 1986c; 1990b), and at several localities along the West Fork Trinity, Sanger Alluvium is exposed below Pilot Point Alluvium.

The Sanger Alluvium is defined as an alluvial unit stratified below the floodplains of the Elm Fork Trinity and West Fork Trinity, and below the floodplain of at least one tributary to the West Fork Trinity (Ferring, 1988a, 1993). The lower boundary of the Sanger Alluvium is the contact with the Aubrey Alluvium. The upper boundary is a buried soil and the overlying Pilot Point alluvium. At the Aubrey Site (Ferring, 1989b; 1989c; 1990c), along Village Creek (Ferring, 1988a; Caran, 1990a,b) and at the Gateway locality near Fort Worth (Ferring, 1986c; 1989a) a moderately developed soil occurs at the top of the unit. The same stratigraphy was described at other sites in Ray Roberts Lake at 41CO150, 41CO144 and 41CO141. At the Aubrey Site this unit is dominated by calcareous clays and silts. Sand and/or gravel are revealed in some channel cutbanks and in borehole logs, but overall the dominant lithology appears to be fine grained calcareous alluvium.

The abrupt shift to valley alluviation is presumed to have been caused by an increase in annual precipitation and/or an increase in convectional storm activity. Moist early Holocene climates are documented by a) lacustrine deposits on the High Plains (Holliday, 1985; Holliday and Allen, 1987; Haynes, 1975), b) pollen data from Ferndale Bog in southeastern Oklahoma (Bryant and Holloway, 1985) invertebrate faunas from Lake Theo (Neck, 1987) and vertebrate faunas from a number of Southern Plains localities (Johnson, 1986; Graham, 1987; Graham and Mead, 1987). In the Upper Trinity River Basin, the disconformity between the Aubrey and Sanger alluvial units is a stratigraphic boundary for the Pleistocene-Holocene boundary that was climatically controlled. A soil formed in the upper part of the Sanger alluvium during the middle Holocene. At Aubrey this period of floodplain stability/ slow aggradation lasted for ca. 2,500-3,000 years. The middle Holocene soil appears to have formed under drier climates than today, with little alluvium being delivered to floodplains.

Pilot Point Alluvium (Late Holocene: 4.5 ka-present).

The Pilot Point Alluvium occurs at and below the floodplains of the larger streams in the Upper Trinity River Drainage Basin. The lower boundary of the unit is defined by geomorphic setting, and is either a) the contact with the underlying Sanger Alluvium where floodbasin facies are superposed, b) truncated Carrollton Alluvium, or c) an erosional contact with Sanger/Aubrey or older alluvium along present meanderbelts. Away from present meanderbelts, the upper boundary of the Pilot Point Alluvium is the floodplain surface, where a thick, cumulic soil is present in the Pilot Point Alluvium. Along present meaderbelts, the Pilot Point Alluvium includes point bar, oxbow, other channel fill and some vertical accretion (floodbasin) facies; in these settings, the upper boundary of the Pilot point Alluvium is the contact with overlying recent alluvium. Also, along present meanderbelts a thin cumulic or pachic soil, the "West Fork soil" has formed in the upper part of the inset Pilot Point Alluvium (Ferring, 1986c; 1990d).

Recent alluvium. Recent alluvium, 1-1.5m thick, buries the Pilot Point alluvium along modern channels, and is also present as fill of recently abandoned channels. Recent alluvium thins laterally away from modern channels. This alluvium is more extensive over the Pilot Point Alluvium at the upper end of Lewisville Lake, as a consequence of reservoir construction and a locally elevated base level. Along the West Fork Trinity River, between Dallas and Fort Worth, recent alluvium is also extensive upstream from bedrock controlled valley constrictions.

The stratigraphic and sedimentary framework described here is the context for archaeological sites and the setting for archaeological research in the Ray Roberts area. When combined with paleoenvironmental data, and with studies of archaeological sites and their formation processes, a geoarchaeological synthesis will be attainable.

CHAPTER 7
LATE QUATERNARY PALEOENVIRONMENTS

In order to interpret the archaeological records from Ray Roberts, a paleoenvironmental history based on different kinds of independent evidence is essential. Climatic and environmental change in the north Texas region is reviewed using several kinds of data from a variety of study locales (Figure 7.1). This review serves as a framework for evaluating local evidence of environmental change that may have been significant with respect to prehistoric adaptations to the Ray Roberts area.

Regional Paleoenvironmental Records

Pollen

There are no pollen records from the upper Trinity River basin, but a few dated pollen spectra are available from peripheral settings (Bryant and Holloway, 1985).

Older claims that the full glacial vegetation of the Southern Plains was boreal in character have been seriously challenged. First, Holliday (1987) used pedogenic data from the High Plains (Llano Estacado) to show that podsolization (essential evidence for forested vegetation) was not part of the late Quaternary soils record there. Hall's (1992b) analysis of full glacial (ca. 19-17 ka old) pollen from the High Plains showed that a grassland not unlike the flora of today existed in that interval. Pollen data from the Aubrey Clovis Site (Hall, 1991) show grassland vegetation between ca. 14.5-12.0 ka, and similar vegetation is recorded at Domebo, Oklahoma, ca. 11.2 ka (Wilson, 1966).

Ferndale Bog, located in the Ouachita Mountains of southeast Oklahoma (Figure 7.1), was cored and studied initially by Albert (1981). The bog was cored again in 1981 by Holloway and Ferring; their deeper core recovered sediments with well-preserved pollen from late Pleistocene to late Holocene (ca. 11.8 to 0.6 ka) (Holloway, 1993). These pollen spectra were briefly described by Bryant and Holloway (1985); a more detailed diagram is shown here in Figure 7.2. These pollen data show that significant changes in Holocene vegetation of the western Ouachita Mountains preceded establishment of the modern Oak-Pine-Hickory community.

The late Pleistocene and early Holocene vegetation was dominated by grass and ambrosia, with moderate frequencies of oak and birch, probably representing sparse upland and riparian arboreal elements respectively. An ambrosia peak at ca. 11 ka is followed by a grass peak ca. 10 ka; declines in these taxa are accompanied by increases in oak and composites. Overall, the early Holocene vegetation is one of an open grassland-artemisia steppe, with a succession to an oak savannah. Early Holocene pollen influx values are very high, suggesting high plant biomass (Figure 7.2). The middle Holocene is a period of continued succession to a mixed oak-pine-hickory forest. Pollen influx values decline markedly in the middle Holocene. This trend is perhaps even more pronounced when the higher overall pollen influx from mixed forests is contrasted with the relatively low influx from prairie communities.

The Ferndale Bog pollen diagram can be divided simplistically into an early Holocene record of a high pollen influx prairie-steppe vegetation and a late Holocene, low pollen influx mixed forest vegetation. In this sense the middle Holocene is a period of compositional transition. In part this pollen record must be viewed as one documenting an ecological succession from the late Pleistocene prairies of the Southern Plains (Wilson, 1966; Hall, 1992a) to the present forests of southeastern Oklahoma. On the other hand, the very low pollen influx values of the middle Holocene, especially between 6.5-5.5 ka, suggest significant biomass reduction, presumably caused by lower annual precipitation.

A pollen record from Boriack Bog, in central Texas also records vegetation changes during the Holocene (Bryant, 1977; Bryant and Holloway, 1985). Although not well dated, the pollen data from Boriack

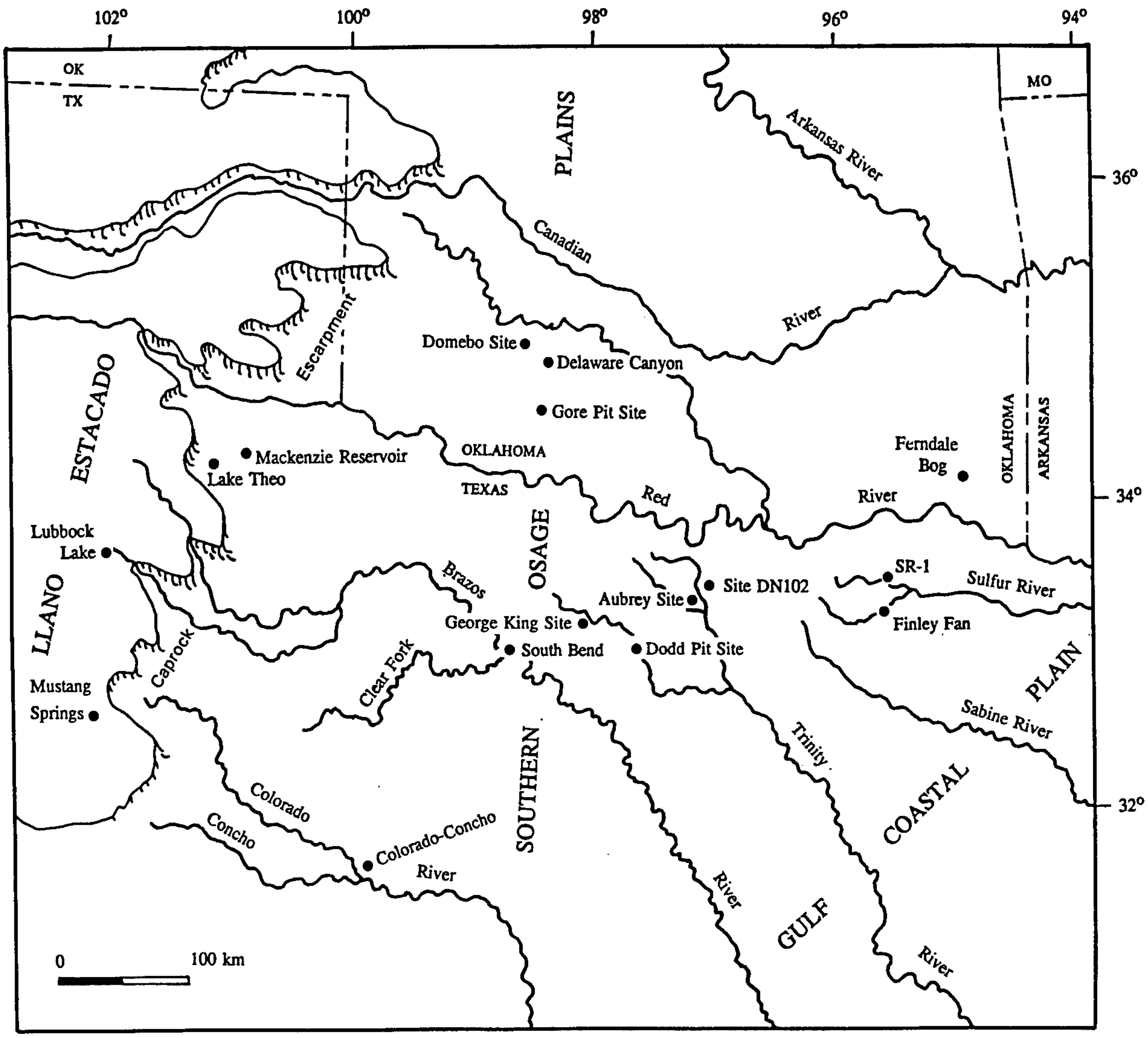


Figure 7.1 Map of the Southern Plains with localities yielding paleoecological data.

document a general reduction in arboreal taxa after ca. 10 ka, accompanied mainly by an increase in grasses. The highest grass frequencies are in samples slightly below a horizon dated ca. 3.8 ka; above that dated horizon, arboreal taxa, mainly oak and small amounts of pine, increase.

Other pollen data from the Southern Plains are almost all from late Holocene sediments, dated younger than ca. 2 ka (Hall, 1988). The pollen data from Ferndale Bog and Boriack Bog suggest that Holocene vegetation reflects successional changes from the late Pleistocene communities, coupled with a general drying trend that appears to have climaxed during the middle Holocene.

Vertebrates

A review of late Pleistocene and Holocene vertebrate faunal data from central Texas by Lundelius (1967) in many ways set the stage for research over the succeeding 25 years. The full glacial faunal

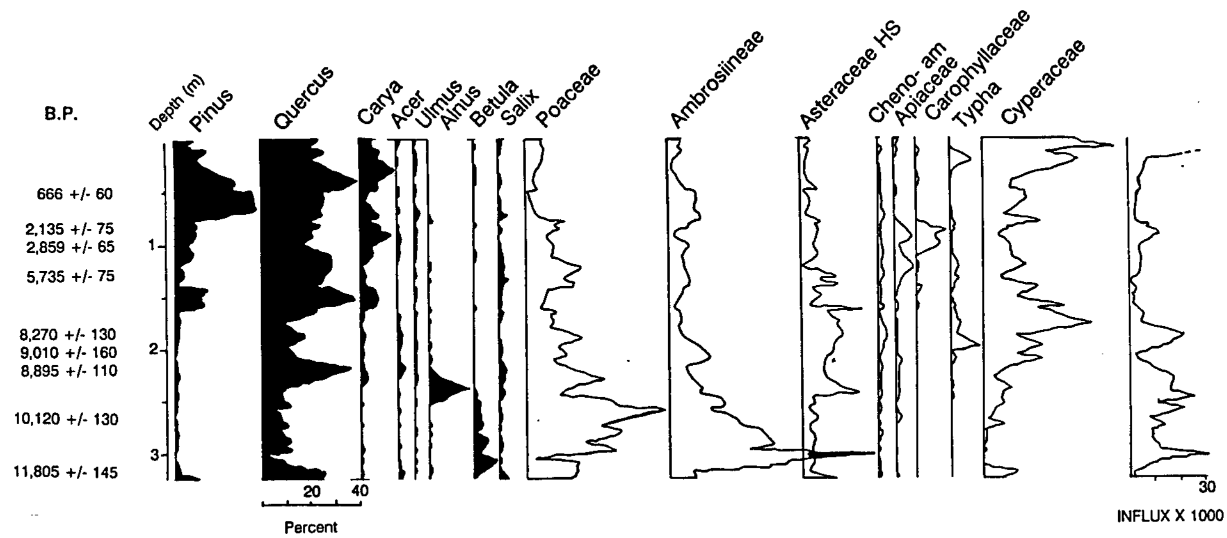


Figure 7.2 Pollen diagram from Ferndale Bog, Oklahoma (data from Holloway, 1993).

assemblages from the Southern Plains are disjunct, with sympatric associations of taxa that today occupy very different ecological settings. This pattern has been further elaborated on in reviews by Graham (1987) and Graham and Mead (1987). The glacial faunas are interpreted as indicating ecological relations different from today, yet their precise meaning is difficult to assess. Markedly reduced extremes of seasonality and wetter full glacial climates are usually inferred from the faunal assemblages. Vertebrates and invertebrate faunas from the 22-20 ka old Carrollton section near Dallas indicate conditions wetter than today, and with significantly greater stream discharge (Willimon, 1972). Vertebrate faunal assemblages from the Aubrey Clovis Site are indicative of prairie habitats from ca. 14.5 ka to Clovis time (ca. 11.5 ka), suggesting conditions less forested and probably drier than today. These data offer support to Haynes' (1991) conclusion that climates were dry prior to and perhaps during Clovis occupations.

Lundelius (1967) concluded that the post-Wisconsin faunal record "... is interpreted as showing a gradual drying of the climate and an increase in seasonality. There is no indication of drier conditions during the Altithermal." (Lundelius, 1967, p. 316). His observation that middle Holocene faunal assemblages indicate climatic conditions that were moister than those of today was in accord with certain interpretations of Altithermal climates in the Southwest, but is in contrast with many recent views on Altithermal climates in the Southern Plains (Meltzer, 1992; Johnson and Holliday, 1986).

Based on an analysis of microfaunas from the Wilson-Leonard site in Central Texas, Winkler (1990) has reiterated the interpretation of Lundelius that middle Holocene climates were wetter than today, but did document a trend towards warmer and drier climates beginning about 8 ka. Winkler (1990) concluded that between ca. 9-2 ka fauna from Wilson-Leonard are indicative of conditions moister than today.

Similar conclusions were reached by review of Holocene faunas from the Southern Plains by Graham (1987), who noted that a drying trend began ca. 8 ka. Although Graham stressed that middle Holocene faunas signify climates that were drier than the early Holocene, he contends that they were nonetheless moister than those of today. Graham (1987) also cites evidence from a number of localities indicating a return to moister conditions in the late Holocene, beginning ca. 4 ka. As opposed to a model of progressive aridification throughout the Holocene, Graham suggests climates fluctuated from moist conditions in the early Holocene to a dry middle Holocene interval with a return to moister conditions after that time.

The response of Bison populations to environmental change on the Southern Plains was assessed by Dillehay (1974). He concluded that Bison were rare during the middle Holocene period from ca. 8/7 - 4.5 ka. Another interval with few Bison occurrences was dated to between ca. 1.5 and 0.75/0.65 ka. Bison were relatively common in the remainder of the period Dillehay considered (12-0.4 ka). Lynott (1979) found complimentary evidence in north central Texas archaeological faunas for late Holocene Bison presence ca. 1.5-0.4 ka. His assumption that Bison were prevalent because of dry climates and a local shift to short grasses needs reappraisal.

Dillehay's assessment of middle Holocene Bison occurrence was later strengthened by McDonald (1981), who compiled data on Bison from archaeological and paleontologic localities and showed that Great Plains Bison populations were clearly reduced during the middle Holocene interval. More importantly, these reductions in Bison population were pronounced in the Southern Plains compared to the Northern Plains (Figure 7.3). Archaeological data acquired from this region since the 1981 publication of McDonald tend to support the late Holocene patterns he observed.

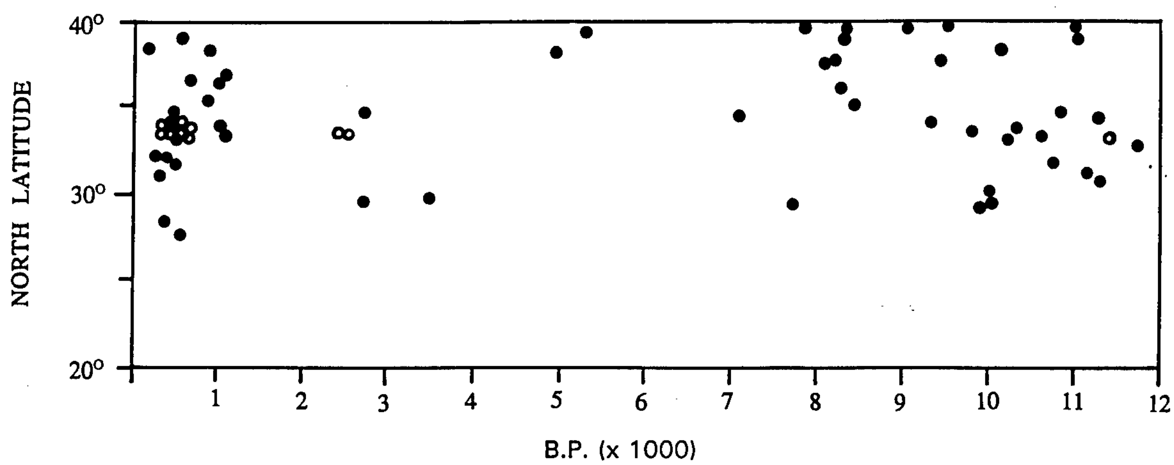


Figure 7.3 Plot of bison presence on the central and southern Great Plains (from McDonald, 1981; circles show data from the upper Trinity River Valley).

Bison dental attrition data from the Lubbock Lake site indicate that Southern High Plains Bison populations were stressed but nonetheless present, at least periodically, during middle Holocene time (Johnson and Holliday, 1986). There, a number of Bison remains, hearths and artifacts attest to periodic occupations of the Lubbock Lake locality during the middle Holocene.

In sum, many vertebrate data provide evidence of climatic conditions during the full glacial period that were apparently wetter than during the Holocene; the effects of reduced temperatures and diminished seasonality make precipitation estimates difficult. Drier conditions are suggested for the terminal Pleistocene. The Holocene record indicates moist climates during the early and late Holocene, interrupted by a dry middle Holocene (Altithermal) interval, although comparisons of Holocene climates with modern climates is difficult.

Mollusks

Fullington and Fullington (1982) compared molluscan faunas from three localities in southwestern Oklahoma (Figure 7.1); these include the Clovis-age fauna from the Domebo Site (Cheatum and Allen, 1966), the middle Holocene (ca. 6 ka) fauna from the Gore Pit Site (Cheatum, 1974) and their own analysis of late Holocene (ca. 2.0-0.4 ka) faunas from Delaware Canyon (Ferring, 1986c). These faunas showed a clear reduction in species diversity through the Holocene. The Domebo fauna, from pond sediments, had 31 species, compared to only 15 species from the Gore Pit Site, which was in an alluvial setting. The late Holocene faunas are more diverse (perhaps owing in part to thorough recovery techniques), yet the modern fauna includes only 12 taxa.

Neck (1987) analyzed a series of molluscan faunas from the Lake Theo site, located at the base of the caprock escarpment of the Llano Estacado and at the western margin of the Rolling Plains (Figure 7.1). The faunas date from late Pleistocene to late Holocene (ca. 12.0- 0.95 ka). Following the moist early Holocene, there was progressive extirpation of taxa, beginning with loss of northern species and followed by loss of eastern mesic species. By ca. 5.5 ka the faunas were essentially modern in composition, although further extirpations were documented. Neck notes that decreases in precipitation and increased seasonality were probably the most important factors associated with these changes in snail faunas.

Stable Isotopes

Haas and others (1986) employed analysis of carbon isotopes to assist in environmental reconstruction at the Lubbock Lake locality. Although their samples derived from both marsh sediments and buried soil A horizons, samples dated between ca. 10.0-0.4 ka show a significant shift towards isotopically enriched compositions that persisted between ca. 8 ka and 5.2 ka. These data suggested vegetational shifts towards C4 taxa associated with drying climates (see also Holliday, 1989). This study was followed by carbon isotope study of sediments from Mustang Springs, situated at the southern margin of the Llano Estacado (Meltzer, 1991). There, a roughly similar record of isotopic change was obtained; the early Holocene samples are isotopically depleted, indicative of lacustrine sediments and apparently wetter climate. About 8-7 ka there is a marked shift to compositions enriched in ^{13}C, indicative of a shift to higher C4 plant biomass.

Humphrey and Ferring (1994) studied a series of 58 lacustrine, spring and pedogenic carbonate samples from the Aubrey Clovis site (Figure 7.4). The δ^{13}C of pedogenic carbonates is ca. 8-12 ‰ less than that of associated organics, but the trends in carbonate carbon isotopic composition can be used to infer plant biomass (Cerling, 1984; Quade and others, 1989; Margaritz and others, 1981). At Aubrey the early Holocene samples are depleted in ^{13}C. During the middle Holocene, ca. 8-4 ka, there is a clear enrichment in ^{13}C, followed by a return to lighter compositions in the late Holocene. This floodplain record shows a clear decrease in C3 plant composition during the middle Holocene.

The oxygen isotope data from Aubrey are the first isotopic evidence for Holocene temperature fluctuations on the Southern Plains (Figure 7.4). These show a clear episode with depleted isotopes in the latest Pleistocene, indicating colder temperatures; alternatively this trend could signify an influx of depleted meltwaters to the Gulf of Mexico. Nonetheless, this is followed by a rapid warming trend into the Holocene. Importantly, no evidence for warmer temperatures is indicated for the middle Holocene. Rather, average annual temperatures appear to have remained quite stable following minor fluctuations in the early Holocene.

Stable isotopes support an interpretation of colder late Pleistocene climates, followed by essentially modern temperature regimes during all of the Holocene. Carbon isotope trends indicate dry terminal Pleistocene compositions. The Holocene record is one of wetter conditions in the early Holocene followed by a marked shift to drier climates in the middle Holocene. The late Holocene appears to have been moist, but with a dry period about 2.0-1.2 ka.

Summary: Late Quaternary Climates

The different kinds of data reviewed suggest the following general patterns of Late Quaternary climate change in the upper Trinity River basin (Figure 7.5). The paleoclimatic record for the region has complex implications for geoarchaeological investigations. A primary effect is that of potential changes in resource availabilities that could have conditioned cultural adaptations to the region. A secondary effect is on patterns of erosion, sedimentation and pedogenesis; these factors condition the geologic conditions pertinent to site formation, including burial, weathering and preservation of archaeological records.

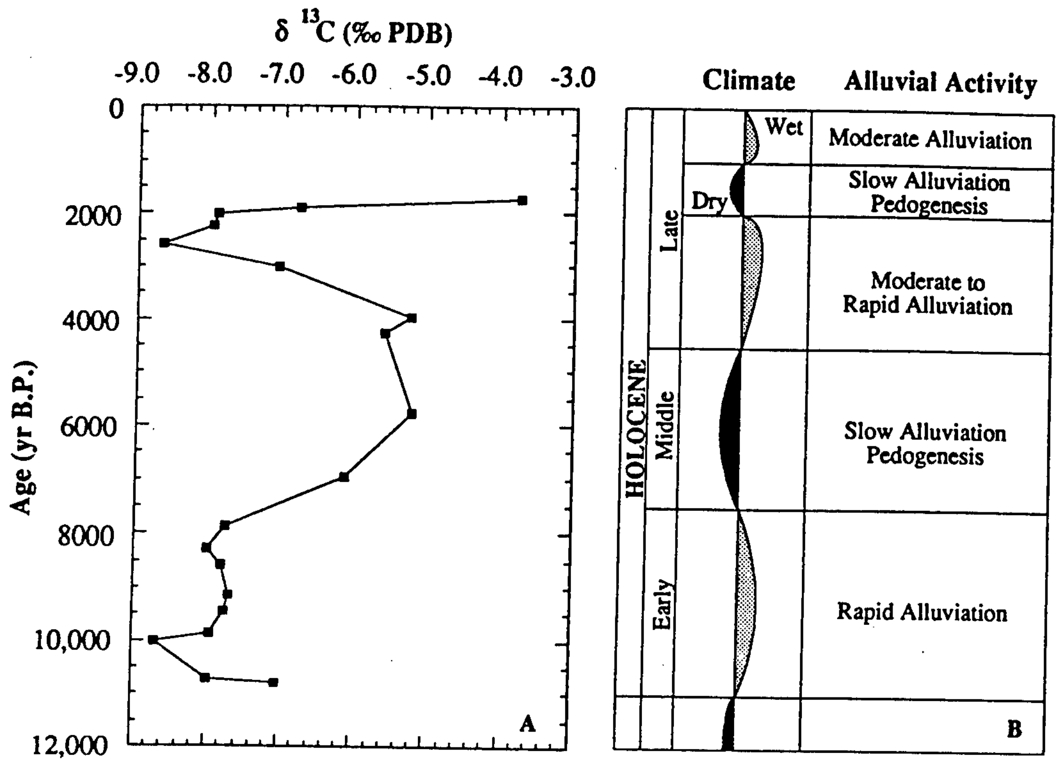


Figure 7.4 Carbon isotopes from the Aubrey Clovis Site (From Humphrey and Ferring, 1993).

Full glacial climates were cooler than today, and possibly wetter, although pollen data during and after the glacial maximum indicate prairies covered the entire region. Given that lower temperatures would have increased effective precipitation, the vegetation record suggests that rainfall was clearly not greater than today-at least not high enough to promote expansion of the range of forests seen today. The prairie-forest ecotone was still significantly east of today's position ca. 12 ka, and appears to have moved westward during the early Holocene. At the same time, the available pollen and faunal data do not suggest either that the climates were significantly drier than today. These seeming constraints on the magnitude of climate change in this region during the glacial maximum are critical for assessing patterns of alluvial morphogenesis.

Post-glacial climates were clearly dry, until about 11 ka. This is supported by faunal and pollen data, especially from the Aubrey Site. The early Holocene was a period of greater precipitation. This interval was probably wetter than today, based on faunal, pollen and isotopic evidence. It was also a period when increased seasonality returned to this region. Extinction of Pleistocene megafauna was finished by earliest Holocene and dispersal of disjunct taxa was basically completed during this interval.

Middle Holocene climates were drier than the early Holocene. Isotopic data from Aubrey suggest they were not warmer, but an increase in seasonality may have occurred. Microfaunal data suggest that although drier than the early Holocene, conditions may have been somewhat moister than today; this conclusion has not been reached using other kinds of data.

About 4 ka moister climates are well documented. These persisted in the late Holocene until about 2 ka, when a dry period began, lasting until about 1.2 ka. Another moist-dry cycle of moderate amplitude ensued. Thus, the late Holocene was a period of fluctuating climates that were, on average, wetter than the middle Holocene.

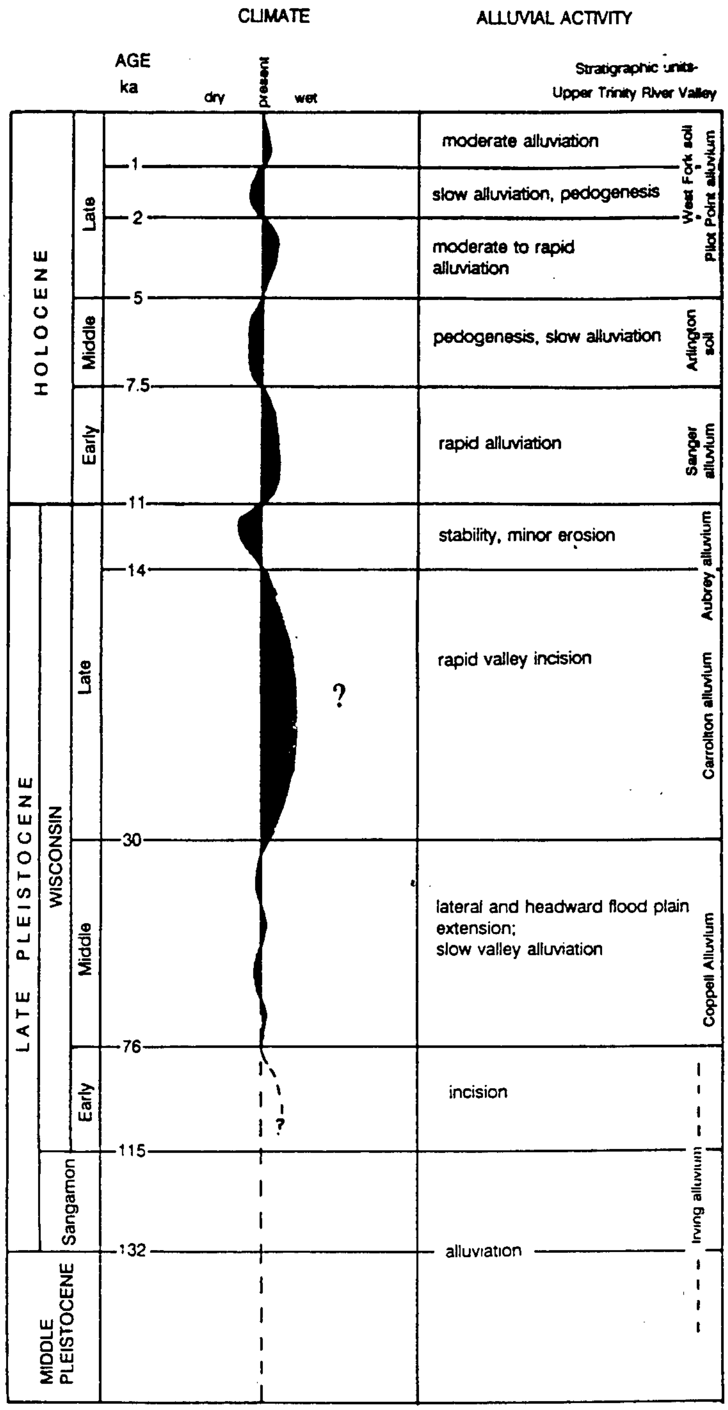


Figure 7.5 Late Quaternary climatic reconstruction and alluvial history for north central Texas and the upper Trinity River Valley (from Ferring 1993).

PART III. GEOARCHAEOLOGY: FLOODPLAIN SITES

INTRODUCTION

Geologic investigations of the Trinity River, as well as geoarchaeological consideration of site formation processes indicated that the optimal place to study stratified and/or well-preserved archaeological records at Ray Roberts Lake was in sediments below the floodplain (Ferring 1986a). During the 1986 reassessment of prehistoric sites, emphasis was given to floodplain localities. Of the previously recorded sites, two floodplain localities were selected for mitigation: 41DN99 and 41DN197. After the latter was prematurely inundated, effort was shifted to 41DN103, which had been tested previously (Skinner 1978). Two additional sites were fortuitously discovered in construction areas after 1986: the Bobby D Site (41CO141) and the Gemma Site (41CO150). Last, the Jayrn Site (41CO144) was found during backhoe assisted survey of the floodplain north of the Bobby D site (Figures III.1, III.2). These sites, especially the ones along the Elm Fork in Cooke County, clearly contain some of the better archaeological records of late Holocene occupations thus far studied in this region.

Despite the fact that these are all "floodplain" sites, their individual geoarchaeological records exhibit considerable intra and inter-site variation. As the investigations at these sites showed, significant differences in site formation processes were effected by even short-distance variations in depositional and pedogenic histories. Each of these sites yielded late Holocene records of geology and archaeology, and each is situated along late Holocene meanderbelts. Three of the sites (Gemma, Jayrn and Bobby D) are situated at constrictions in the Elm Fork valley (Figures III.2, III.3, III.4). As noted during test excavations at the Bobby D site, this geomorphic setting promoted frequent channel shifting and preservation of channel deposits that contained stratified archaeological horizons (Ferring 1987b). At each site, however, other sedimentary histories provided different site formation settings. Review of the discussion of the Pilot Point alluvium and late Holocene environments, provided in Chapter 6, is pertinent to the following chapters on floodplain sites. At the same time one should note that study of these sites contributed significantly to the development of the late Holocene alluvial history in the Upper Trinity Valley; in that sense the geologic history in Chapter 6 and the following site discussions embody an acknowledged degree of circular reinforcement.

Site 41DN99 is different from the others in that it is located along the main Isle du Bois channel, and has archaeological materials in Holocene floodplain deposits as well as an adjacent terrace surface. Sediments there are very sandy in contrast to the other sites which mainly have calcareous clay and silt alluvium. The Britt Site, located farther downstream on Isle du Bois, is essentially on the Elm Fork floodplain, and its geology is different as a result of supply of fine-grained alluvium from the Elm Fork. The following descriptive analyses first consider the geology of the sites, then their archaeological records, and last a geoarchaeological interpretation of site formation processes. While geologic investigations were conducted at each site, logistical and climatic restrictions led to intensive efforts at four sites (CO150, CO144, CO141 and DN99). These sites not only contained important archaeological records, but also important geologic data relating to late Holocene environments in the study area. Results of detailed geologic study at these sites are extrapolated to those where less intensive investigations were undertaken.

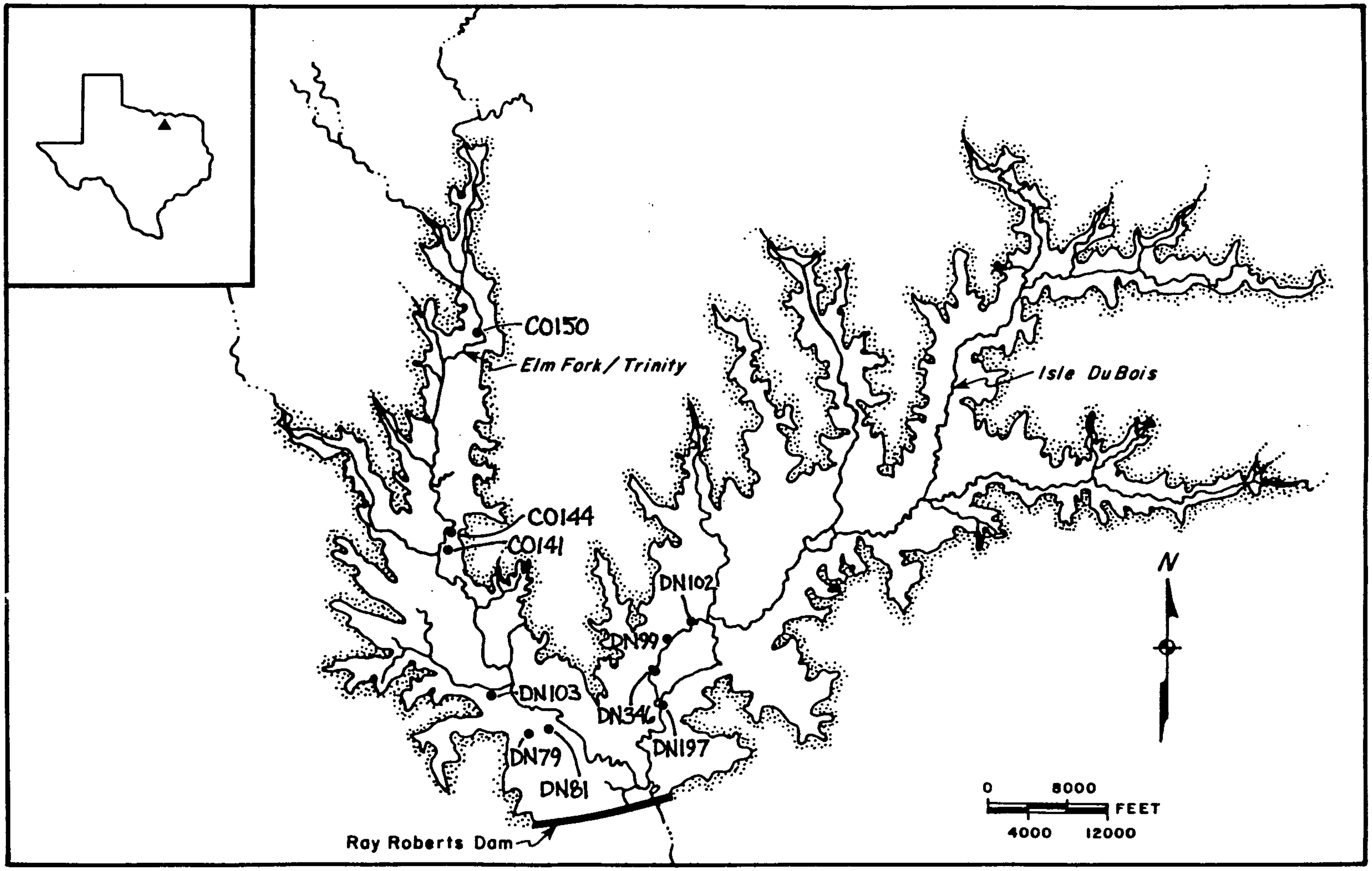


Figure III.1Map of Ray Roberts Lake with prehistoric mitigation sites.

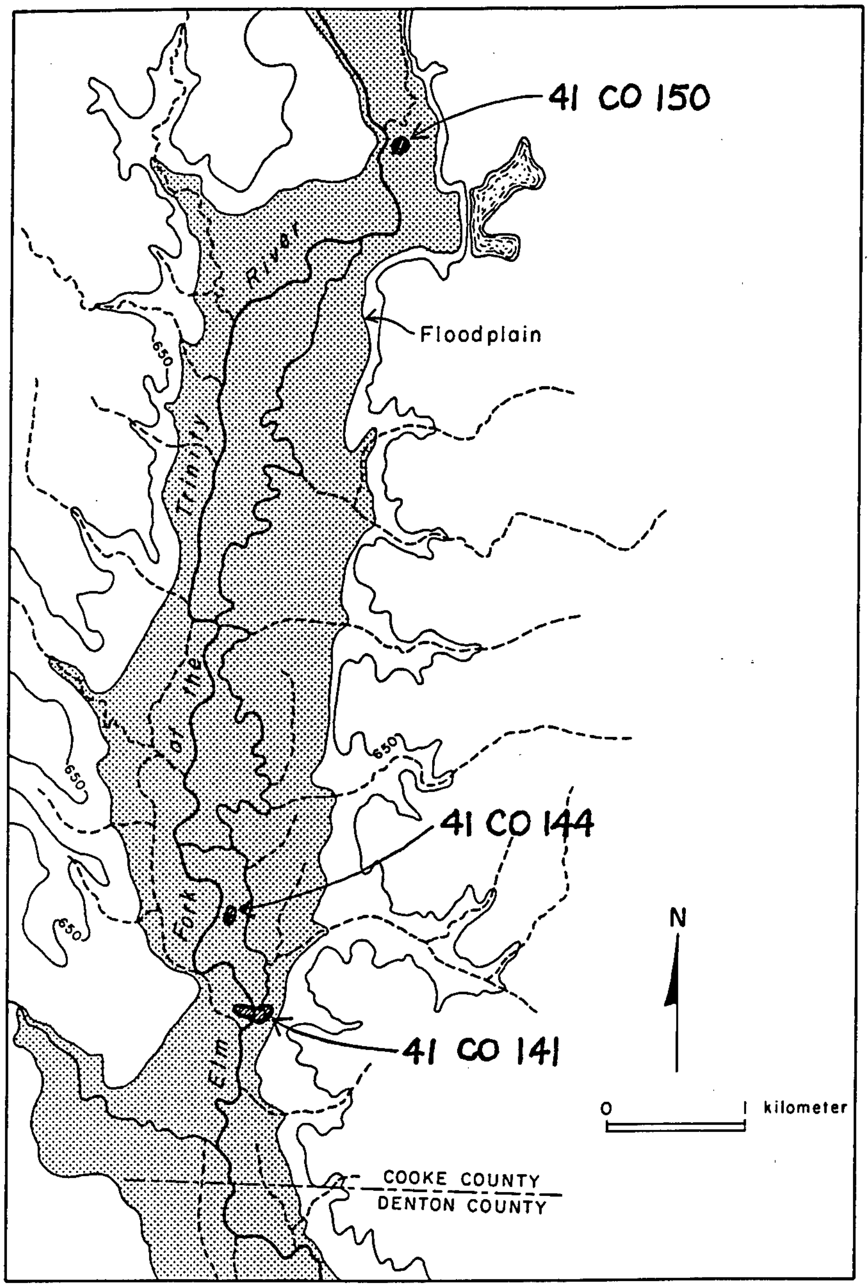


Figure III.2 Map of central Elm Fork Valley at Ray Roberts, with Sites CO150, Co144 and CO141.

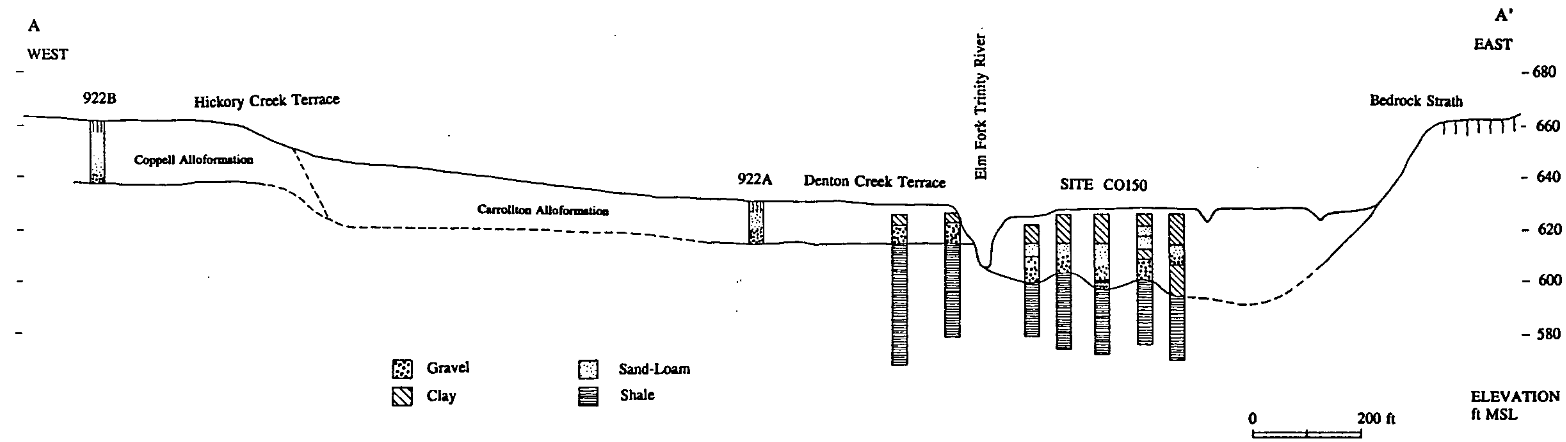


Figure III.3 Geologic Cross-Section of the Elm Fork Valley near siteCO150.

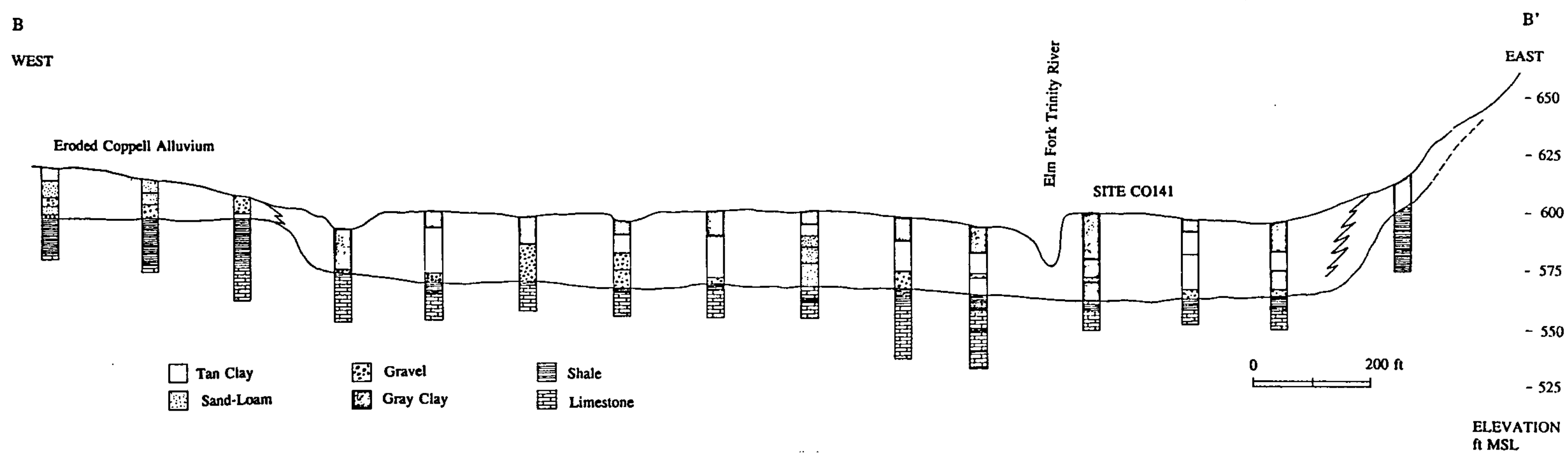


Figure III.4 Geologic Cross-Section of the Elm Fork Valley near Spring Creek.

CHAPTER 8
THE GEMMA SITE (41CO150)

INTRODUCTION

The Gemma Site is located on the Elm Fork Trinity River floodplain at the northernmost part of Ray Roberts Lake, east of Valley View Texas (Figure III.2). The site was discovered by construction personnel in a drainage ditch associated with borrow pits east of the site. Deep geologic exposures revealed stratified hearths, faunas and artifacts in the fill of an old channel of the Trinity. These exposures obviated the need for initial testing to document the potential significance of the site. Preliminary geologic study including a radiocarbon age of about 2,900 yr BP from the lower part of the main section led to recommendations for mitigation. Because of the depth and apparent complexity of the site, more effort was recommended for the Gemma Site than any other at Ray Roberts. The mitigative efforts here yielded a remarkable record of stratified late Archaic occupation horizons, with abundant features, faunal remains and spatial patterning records of serial occupations between ca. 2,900-1,700 yr BP.

SITE SETTING AND GEOLOGY

Geomorphology

The Gemma Site is located on the eastern floodplain of the Elm Fork Trinity (Figure 8.1). While the immediate site area had been disturbed by road construction and drainage ditch excavation, it was clear that the floodplain surface was flat, and overlooked a slightly lower surface between the site and the river channel that is associated with a young (possibly post-settlement) channel. The eastern valley margin is limestone bedrock and rises steeply from the floodplain. The western valley margin is formed by the Hickory Creek Terrace and a Denton Creek terrace; the surface of the former is clayey, while the Denton Creek terrace is underlain by sandy alluvium perched on an eroded shale bench.

The site is situated in a constriction of the Elm Fork Trinity Valley. Stratigraphic studies showed that in the late Holocene, channels shifted location several times. This process created the remarkable context for stratified late Archaic occupation horizons at this site. East of the site area, a cut-off channel was present. This contemporary geomorphic feature appears to be a good analogue for interpreting the topography, stratigraphy and occupation setting of the site.

Stratigraphy-Geochronology

All of the sediments exposed at the site appear to be Holocene alluvium. Because of multiple events of channel shifting, that were time transgressive with net floodplain aggradation, a complex stratigraphy is present. Changes in local geomorphology and sedimentary environments are very important factors in defining the geologic contexts for archaeological materials here. Four principal stratigraphic units were defined at the locality; these are discussed in chronostratigraphic order (Figure 8.2).

Unit 4 consists of calcareous alluvium that is the oldest deposit exposed. About 2.5 m of this unit was exposed in Trench Y (Figure 8.3) and the trench in Block 1 (Figure 8.4), but the total thickness of the unit is greater. This unit was also exposed in the drainage ditch (Trench 1) to the east and west of Block 2; its eastern boundary was not defined. In Trench Y this unit extends from the ABkb horizon to the base of the trench. A soil formed in the upper part of the unit; this was buried by Unit 3A alluvium. As shown in the profile at Trench Y, the unit is dominated by clay and silt, and is texturally homogeneous from the base up. A slight upward increase in organic carbon probably reflects downward movement of organic material along crack surfaces. The downward increase in carbonates is related to pedogenic processes. No archaeological materials, and only a few bones and snails were found in examining the unit in the deep drainage ditch and backhoe trenches.

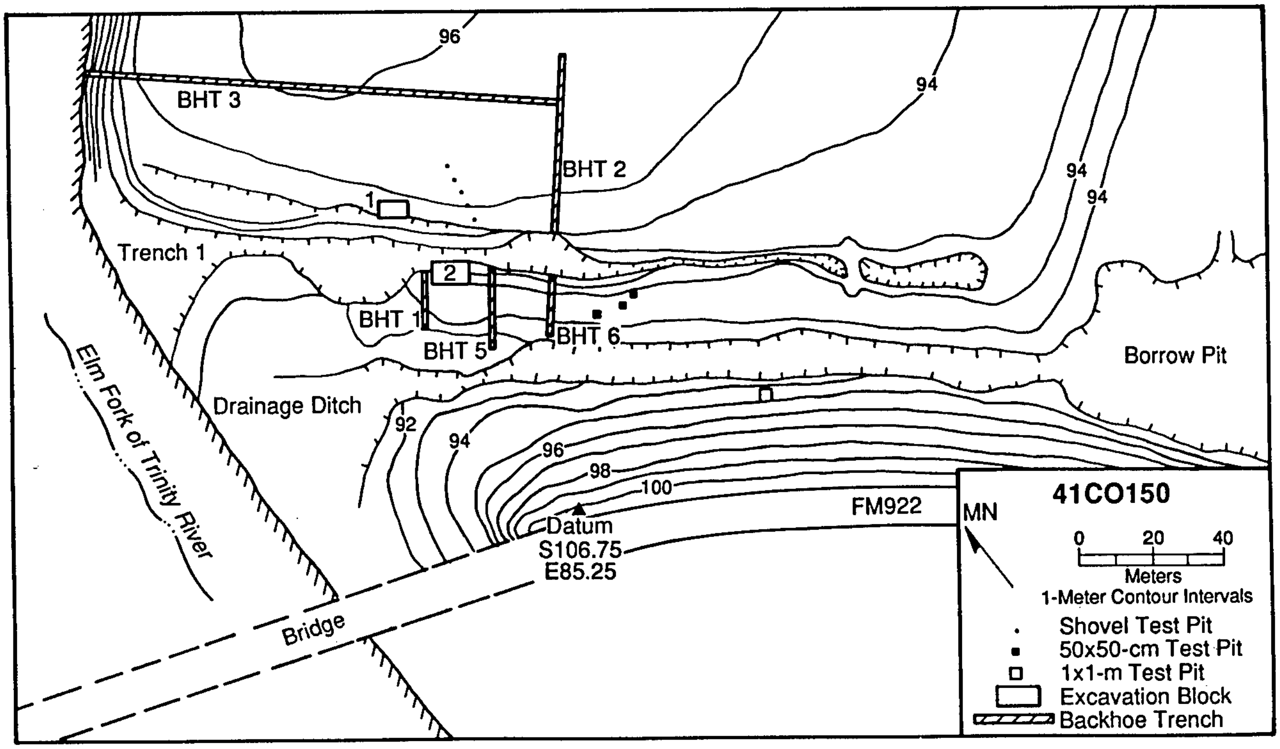


Figure 8.1 Map of the Gemma Site.

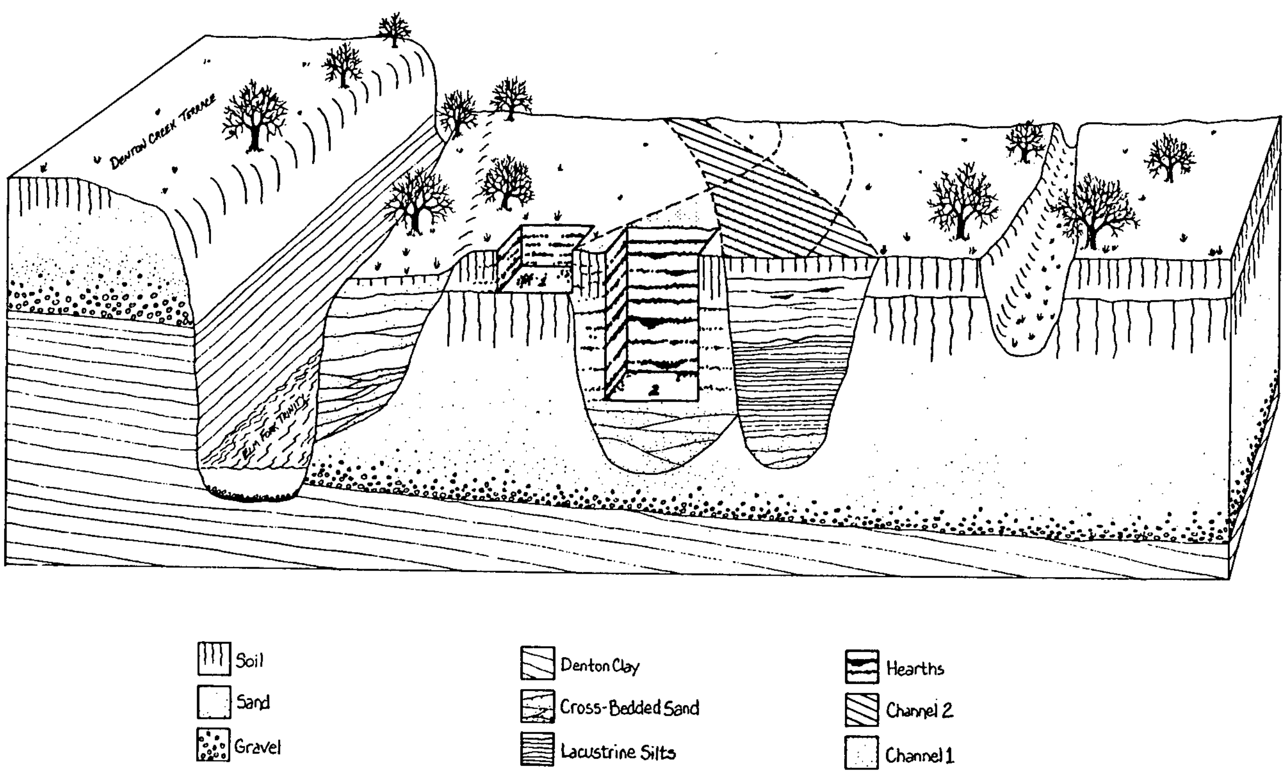


Figure 8.2 Block Diagram of Stratigraphy, the Gemma Site.

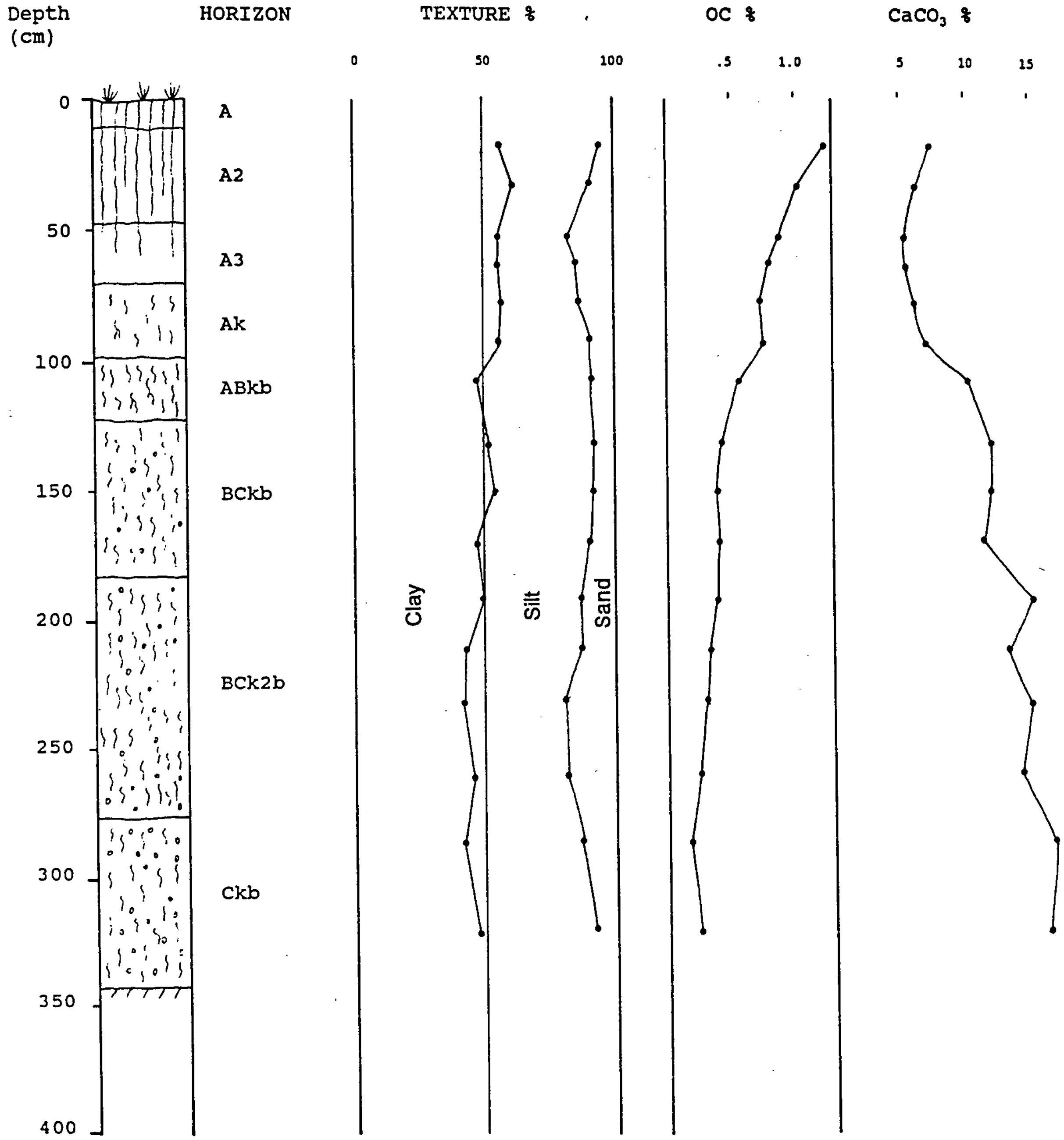


Figure 8.3 Profile of Trench Y, the Gemma Site.

High clay content promoted seasonal cracking of the sediments, and thick, organic rich coats were observed on the crack surfaces to ca. 2.8 m below the surface. A moderately developed soil formed in this alluvium during a period of slow deposition. This was buried by younger sediments, concurrent with pedogenesis; as a result, the two soils were welded together.

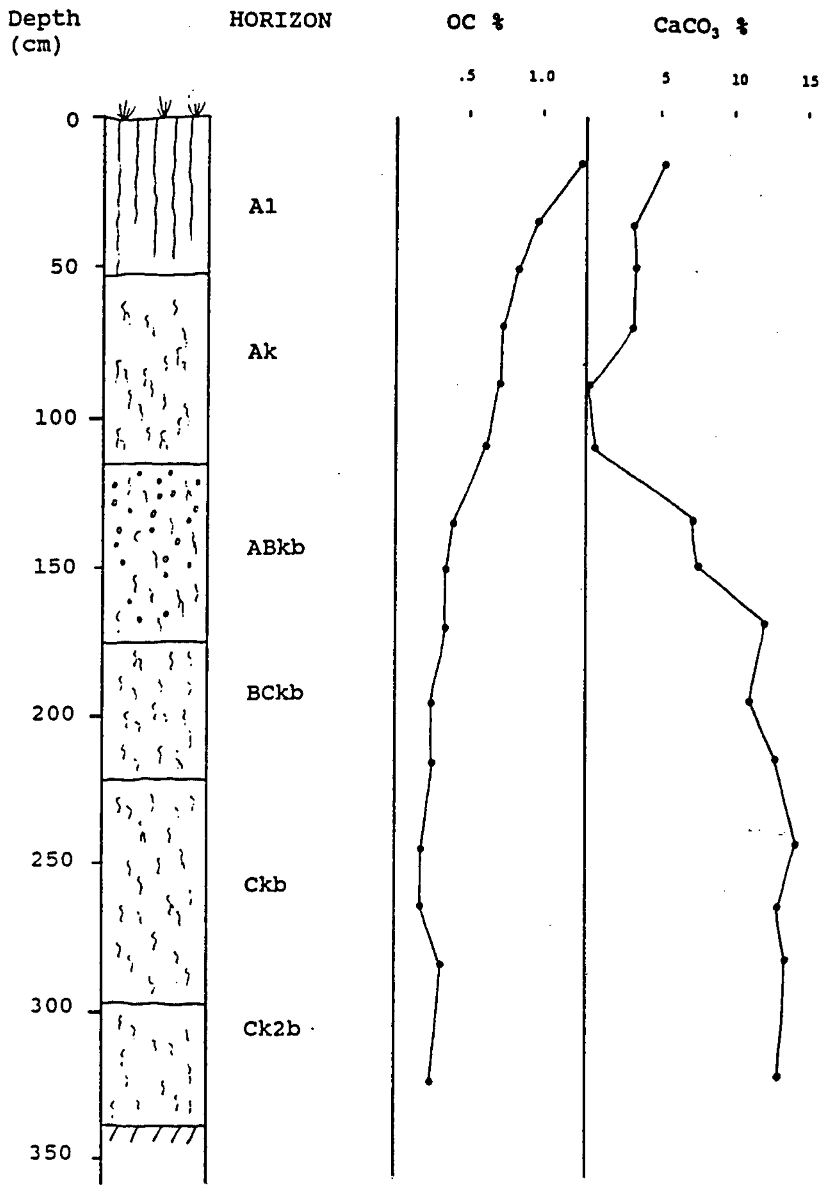


Figure 8.4 Profile of Block 1, the Gemma Site.

Although no radiometric ages were obtained, this unit is correlated with the Sanger alluvium, and is therefore thought to date to the Early Holocene. The soil that formed in the upper part of Unit 4 is assumed to have formed during the Middle Holocene. If this dating estimate is off, it would be an underestimate, based on degree of soil development. This soil provided a paleosurface for the accumulation of archaeological materials at least since Middle Holocene time, yet the oldest artifacts recovered at the contact between Unit 4 and the overlying alluvium are Late Archaic (ca. 3-2 ka).

Incised into Unit 4 alluvium are two Late Holocene channels that are filled with sediment. The fill of the oldest channel is part of Unit 3. This has been cut by the younger channel, which is filled with Unit 2 alluvium (Figure 8.2). Six radiocarbon ages show that the channel was abandoned and filled between ca. 2900-1700 yr BP:

Radiocarbon Ages from Block 2[a]

Lab No.	Stratum	^{14}C Age (corrected years BP)
Beta-32982	A-1	1,680 +/- 70
Beta-32513	A-3	1,985 +/- 70
Beta-32514	B-2	2,750 +/- 60
Beta-32515	B-3	2,600 +/- 50
Beta-32516	B-5	2,320 +/- 70
Beta-16526	B-8	2,910 +/- 250

a all from charcoal samples; all corrected according to Stuiver and Reimer (1986)

The age from Stratum B-5 appears to be anomalously young. The ages from B-2 and B-3 overlap at two standard deviations, and are probably within the error range of technique or may indicate use of old wood for fires.

Unit 3 consists of two stratified deposits. The older, Unit 3B, is fill in the Late Holocene channel. This consists of a fining upward section of thin to medium bedded silt loams and silty clay loams (Figure 8.5). Numerous archaeological features associated with several occupation horizons were exposed in this unit in excavation Block 2 (Figure 8.6). These deposits rapidly filled a channel that appears to have been a chute cut-off (as opposed to a neck cut off that would have become an oxbow). Radiocarbon ages indicate that this channel was abandoned sometime prior to ca. 2900 years bp, and Unit 3B accumulated within a few centuries at most, and probably much more rapidly. The fine-grained texture of the alluvium attests to the fact that the channel was filled with suspended sediment; some traction component is evident only in the lowest part of the fill. Dipping of beds in these deposits, as well as backhoe trench exposures at the locality showed that the channel flowed slightly to the west of south. Stratification and geometry of beds show that the channel filled during discrete flood events, with beds ranging from 10-40 cm thick being deposited by the major events. Many minor floods may have contributed to the fill, but cannot be recognized. The thickness of individual beds varies laterally as a result of channel configuration and possibly because of vegetational obstructions or baffles that cannot be directly inferred. These undulations account for different slopes and thicknesses of the occupation surfaces within this deposit. Overall, this was an unusual, but highly important positive factor in the archaeological site formation processes here. Repeated occupation of the channel by Late Archaic populations left a remarkable series of stratified living surfaces within this unit.

The modern analog to this geologic scenario is a cut-off channel that was present just east of the site (Figure 8.2). It had a canopy of trees growing on the adjacent floodplain, but very little undergrowth, owing to the youth of the feature and its shaded arbor. The floor of the cut-off channel was therefore smooth, seasonally dry, and blanketed with a thin leaf litter. During dry seasons, and especially during winter months, this channel would provide an excellent sheltered situation for habitation. Seasonal floods would force abandonment (probably of the whole floodplain), and would bury occupation surfaces with alluvium. This sequence would result, as we see in the archaeological record here, in burial and preservation of the occupation surfaces, and separation of them by sterile sediments. In addition to the preservation potential, this burial also prevented scavenging and possible reuse of lithic raw materials by people, as well as scavenging of bones by carnivores.

The upper part of Unit 3 (Unit 3A) conformably overlies Unit 3B channel fill. Unit 3B includes two facies: the upper part of the channel fill, and also vertical accretion deposits that represent continued aggradation of the floodplain. Because some floodplain aggradation probably occurred <u>during</u> the accumulation of Unit 3B, the floodplain facies of Unit 3B that overlie Unit 4, are to some degree time-transgressive with Unit 3B. In the area of Block 2, Units 3B and 3A are superposed (Figure 8.5). The coarsening trend in the upper part of the deposit (Unit 3A) may indicate an increase in flood magnitude between ca. 2,700 and 2,000 yr BP. The rate of sedimentation in the upper part of the section (Unit 3A) is estimated to be 0.19 cm/yr. In Block 1, Unit 3A is

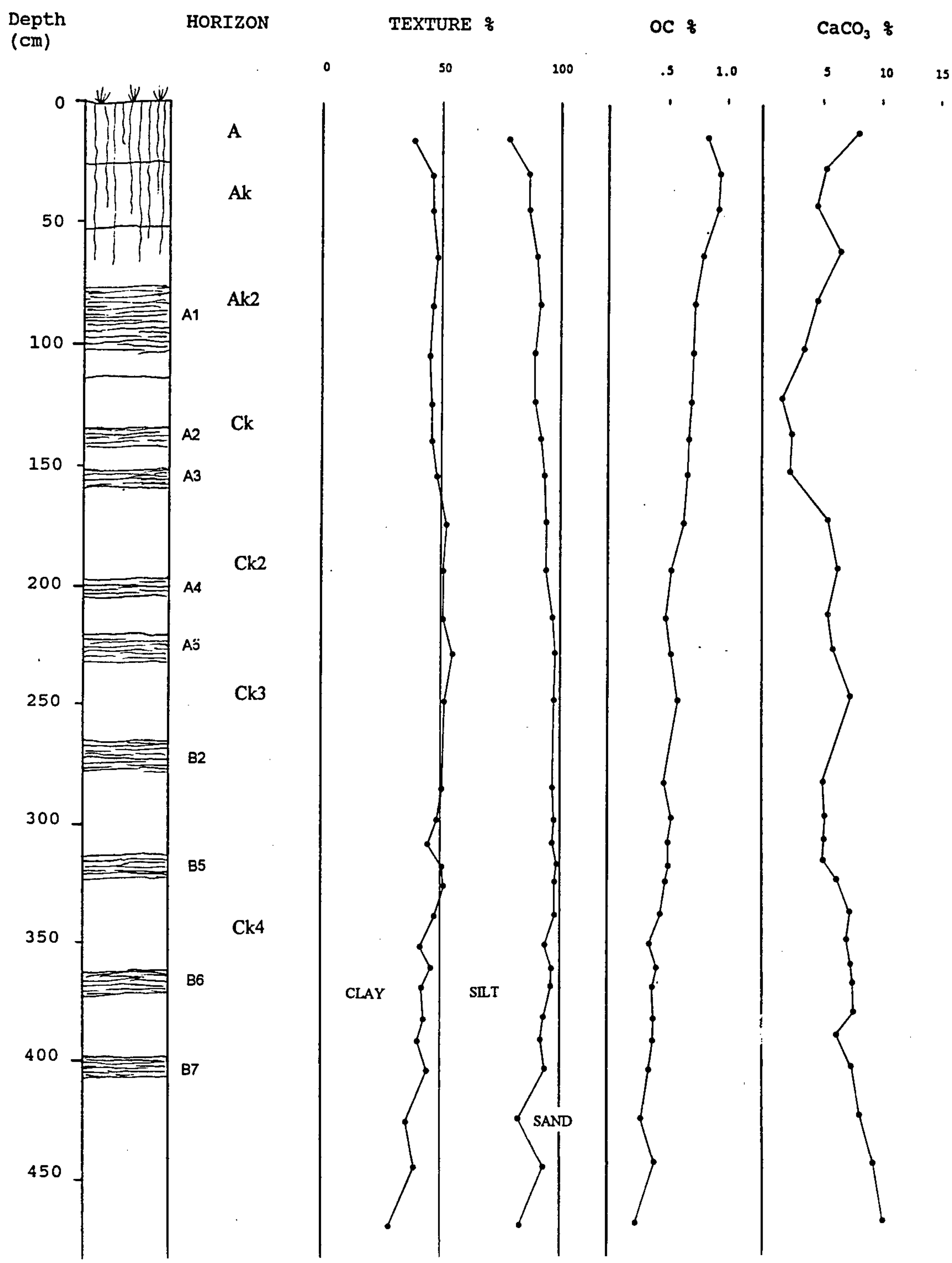
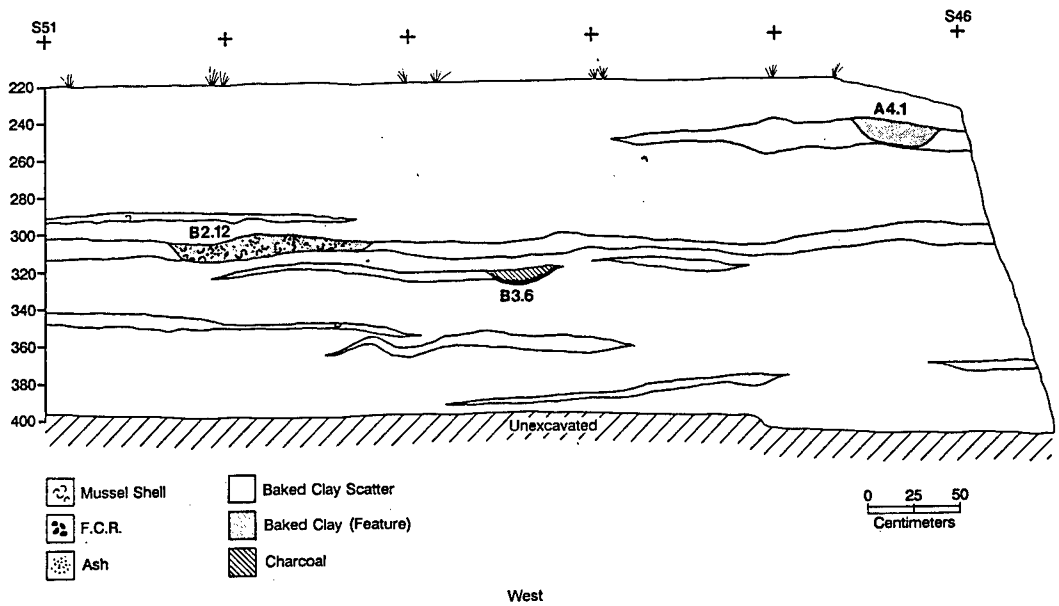


Figure 8.5 Profile of Block 2, the Gemma Site.



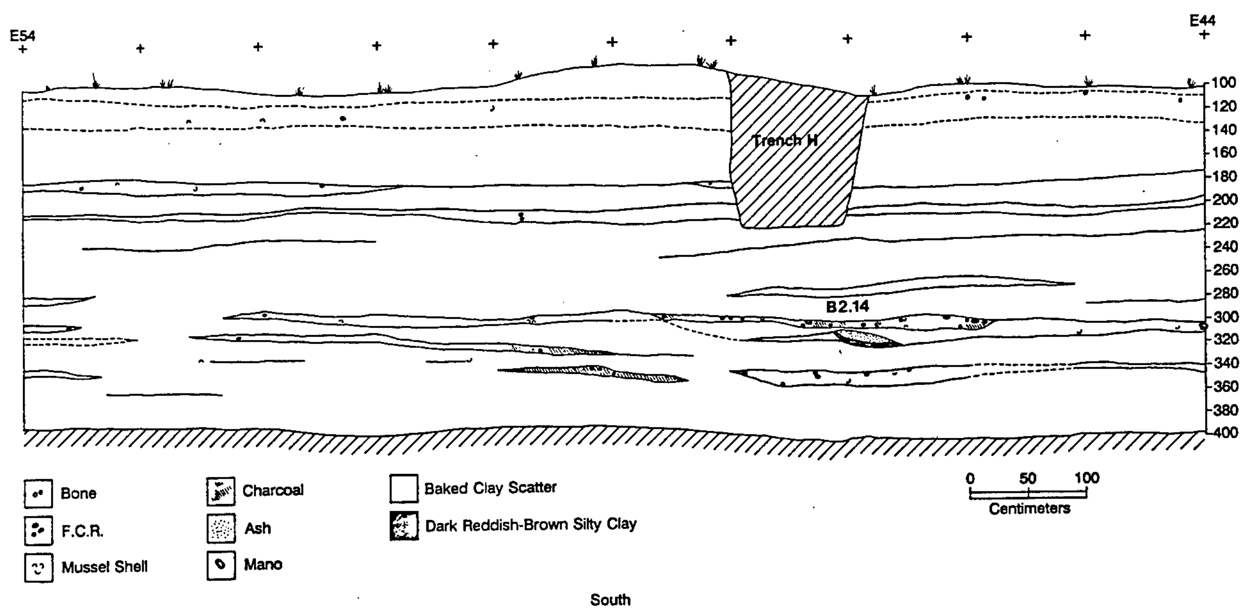


Figure 8.6 Profiles of south and west walls, Block 2, the Gemma Site.

superposed over Unit 4 sediments, as can readily be seen in the soils stratigraphy, and especially the carbonate profile with depth (compare Figures 8.4 and 8.5). In Block 1, the greatest density of artifacts and features is near the contact between Units 3A and 4. This is at the same elevation as archaeological horizon A1 in Block 2, but is probably the stratigraphic equivalent of archaeological horizons A3/A2.

After the old channel was filled with Unit 3 alluvium, and after continued floodplain aggradation, another channel shift took place. First a channel incised through existing sediments (Units 3A, 3B and 4). Then the new channel was cut off, and began to fill with sediment. The fill of this younger channel is Unit 2 (Figure 8.2). The filling of this channel differed from that of the channel associated with Unit 3.

Unit 2 alluvium is divided into two main units. Unit 2B, the oldest, is comprised of thin sandy lenses in the lowest 20 cm that grade abruptly into about 3 m of finely laminated silts. The laminae are comprised of couplets, each with a dark clayey lamina and a lighter silty lamina. These are interpreted as flood episodes, with a coarser, flood stage silt overlain by a post-flood clay unit derived from suspension fall out. These sediments clearly were deposited in an oxbow lake. Cut-off of this channel was therefore different than that of the older channel described above. Unit 2B grades quickly into the overlying Unit 2A, which is comprised of non-lacustrine thickly bedded and bioturbated silty clay loams and silt loams. The change from Unit 2B to 2A signifies the transition from an oxbow lake to a vegetated and seasonally dry channel scar. It is probably not coincidental that two hearths (and in a nearby section at the same elevation were other hearths, bones and a single sherd) were found in the lower part of Unit 2A in Trench Y". A weakly developed soil, very different from that in Unit 3A sediments, has formed in the upper part of Unit 2A. This channel was probably abandoned as a neck cut-off, which promoted isolation of the channel depression and formation of the oxbow lake. The stratigraphic relationship with Unit 3, as well as the presumed late Prehistoric hearths and sherd indicate that this channel was cut, abandoned and filled probably between ca. 1000-500 yr BP.

Another channel cut into the sediments described above, probably in the post-settlement period. The eastern edge of this youngest channel came very near the locations of Blocks 1 and 2. A sharp contact between the Holocene alluvium and the youngest channel fill was exposed in both walls of the drainage ditch. The fill of the youngest channel, Unit 1 alluvium, consists of beds of sands and finer materials. Primary structures are preserved in most of the sand beds. The upper surface of this unit was disturbed by road and ditch construction, but only a weakly expressed soil A-horizon is present.

It is important to note that all three of the channels described here were roughly the same depth as the modern channel. This situation is also documented at sites 41CO141 (Ferring 1987) and 41CO144 (this report). Thus, while slow floodplain aggradation is indicated after ca. 1700 yr BP, channel depths and floodplain elevations changed little in that interval in this locality. Farther downstream at the Aubrey site, several meters of late Holocene floodplain vertical accretion are documented.

Summary: Geoarchaeological Contexts

The principal context for archaeological materials at this site is an abandoned channel that filled quickly with alluvium during the late Holocene (Figure 8.2). The rate of filling appears to have been rapid through the sequence of occupations. This is indicated by natural bedding, discrete occupation surfaces with features and by radiocarbon ages. After the last occupations in Blocks 1 and 2, the rate of deposition appears to have slowed, resulting in pedogenesis, ;although truncation of the deposits during construction prohibited full documentation of the post-occupational sediments. Overall, this rapid channel filling was ideal for preservation of occupation surfaces, most of which are separated by sterile alluvium. Some pedogenesis and bioturbation affected these surfaces, yet the effects were minor compared to a floodplain or stable surface setting.

The site formation setting in Block 1 is different from that of Block 2, since the main occupation in Block 1 is on a disconformity between middle Holocene and late Holocene floodplain sediments. In Block 1, bioturbation and bone deterioration are indicated in the higher part of the section, while the deeper materials were apparently buried more quickly. The major occupations in Block 1 are correlated with the upper part of Block 2, Stratum B.

ARCHAEOLOGICAL INVESTIGATIONS

Testing

Initial test investigations consisted of ten shovel tests, three 50x50cm test pits, and several backhoe trenches that were used to help delimit areas with the greatest concentration of buried cultural material (Figure 8.1). The original drainage ditch excavated during construction of the bridge for FM 922 was designated Trench 1; all other trenches were new excavations.

Trench 2 (ca. 48m long) was placed perpendicular to the original drainage ditch. Trench 3 was excavated perpendicular to both Backhoe Trench 2 and the channel of the Elm Fork of the Trinity River. Backhoe Trench 3, measuring approximately 130m long, traversed the entire area between Backhoe Trench 2 and the river channel. The trenches varied in depth from 1-4m.

Trench 4, which was manually excavated, was placed 4 m east and stratigraphically below the southeast corner of Block 1. This trench was excavated in order to better observe the stratigraphy below Block 1 so that it could be correlated with the stratigraphy on the south side of Trench 1. No artifacts or cultural horizons were noted in Trench 4.

Trenches 5,6,7, and 8 were placed south of Trench 1. They were excavated to help delimit the depth of spoil from road and drainage ditch construction. Trench 5 was placed at approximately E 50 S 47-50 and was shallow because cultural remains were encountered in their primary context immediately below the surface.

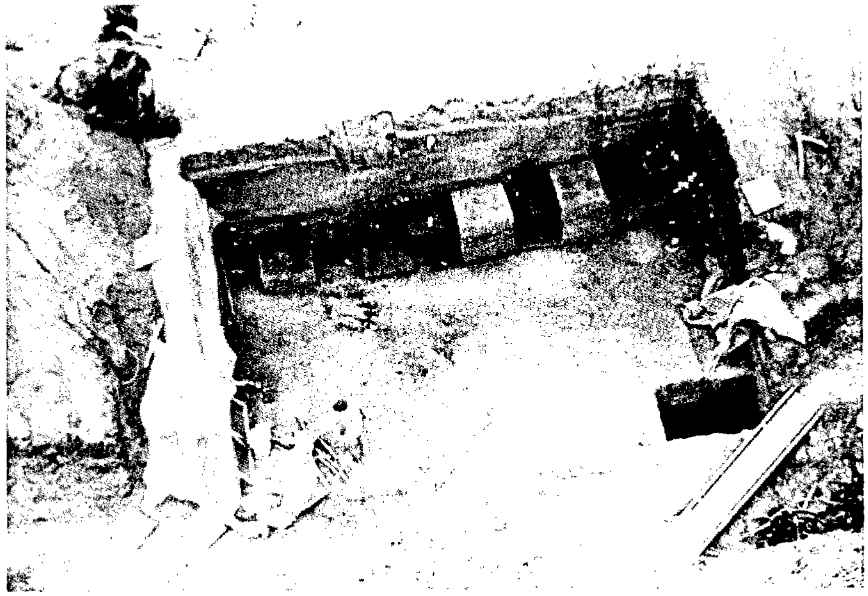
Trench 6, the westernmost trench, exposed several shallowly buried hearths with large quantities of burned rock. Trenches 7 and 8 were placed approximately 33m and 17m east of Trench 6, respectively. Trench 8, 3.5m long, was shallow because in situ cultural materials were encountered quickly. Trenches 6 and 7 were excavated to about 1-2m depth in order to obtain a deep vertical exposure of the stratigraphy.

Excavation Strategy and Methods

After these test investigations, it was concluded that the optimal location for block excavations was in the area where the most features were originally exposed in the drainage ditch. Because of the apparent depth of stratified occupation surfaces, the most significant commitment of effort of any mitigation at Ray Roberts was placed in the area on the south side of the drainage ditch (Block 2). An additional smaller block was excavated on the north side of the drainage ditch, in a different geologic context.

Block 1, measuring 4x8m, was placed on the north edge of the drainage ditch. In addition, two adjacent 1x1-m units were excavated beyond the southwest corner of Block 1, and a 1x1m unit was excavated in the northwest corner for a total of 35 contiguous units (Figure 8.1). Twenty seven units were selected for having 30x30cm fine-screened columns taken from their southeast corners. All other matrix was water screened through quarter-inch hardware cloth. Arbitrary 10 cm levels were employed because neither natural nor cultural stratigraphic units could be seen in the field.

Block 2, measuring 6x10 m with an additional two 1x1-m units at the northeast corner, was located on the south edge of the drainage ditch (Figure 8.7). The west edge of the block was placed approximately 1 m east of Trench 6. Twelve units along the north edge of the block were not complete 1x1-m because of their eroded edges along the drainage ditch, and the upper levels (in Unit A) were also smaller than the full block because of slope. Excavations were begun in arbitrary 10 cm levels in selected units until the cultural stratigraphy was better understood. The provenience of the material recovered from these units was later converted to the cultural stratigraphic sequence. Stratigraphic Units A and B were defined on the basis of



a

b

Figure 8.7 Photographs of Excavations at the Gemma Site. a. aerial view of Block 2 near end of excavations b. shell concentration in stratum B5.

observable cultural horizons. Unit A contained thicker cultural deposits that contained diffuse scatters of artifacts while Unit B contained thinner cultural deposits that were more discrete. Each stratigraphic unit was subsequently divided into strata that represent separate geocultural events. Unit A contained five strata (A1-A5) and Unit B contained 10 strata (B1-B10). Strata B7-B10 were only exposed in a 1x2-m test that was placed in the northeast corner of the block. Excavation within the 1x2-m unit was terminated at the water table.

Block 2, Unit A excavations consisted of 1x1-m units. Culturally sterile matrix between occupation horizons was shovel skimmed and discarded. The matrix within Unit A was homogeneous and occupation levels were recognized only by the presence of artifacts, ecofacts and/or features. The matrix within occupation horizons was water screened through quarter-inch hardware cloth. Unit 47 was selected as a control unit with the southeast 50x50 cm quad being fine screened throughout all deposits including the culturally sterile levels. The control unit was excavated in 5 cm levels through both Units A and B.

Excavation methods in Unit B, Block 2, changed from those used in Unit A. Occupation horizons in Unit B were distinct and were separated by culturally sterile horizons of channel fill. For better spatial control of cultural remains, the 1x1m excavation units were divided into 50x50cm quads. Matrix from each quad was water screened separately, and the southeast quad of each square meter unit was fine screened.

Matrix from culturally sterile horizons was shovel skimmed and discarded. Excavation began on the north part of Block 2 and proceeded south into the embankment in a checkerboard pattern. Alternating 1x1m units were excavated along the north part of the block. After alternating units had been excavated then the intervening units were excavated. Because excavations followed natural and cultural stratigraphy, this procedure permitted better stratigraphic control by providing three profiles to guide excavation within each 1x1m unit. This procedure was invaluable since the former living surfaces often sloped somewhat. Unit 18 was selected as a control unit. All deposits, including culturally sterile levels, were water screened. The matrix from all features was processed by water flotation. All other excavation procedures followed those used at the other sites.

Cultural Stratigraphy

All of the archaeological occupations in Blocks 1 and 2 are Late Archaic. This is clear from the recovered artifact assemblages as well as the radiocarbon ages. Indeed the Gemma Site has yielded one of the best series of stratified Late Archaic occupations in this region. Late Prehistoric occupations are indicated in the younger channel that cuts into the late Archaic channel, yet these were found only at the end of investigations, and were not studied enough to report here, save that hearths and one shell tempered sherd were found in situ in the upper part of the younger channel fill. It is interesting that Late Prehistoric groups continued to use abandoned channels for occupations here as had the Late Archaic groups.

Although differences in the age and assemblage characteristics for Late Archaic occupations here are evident, no phase names are proposed. Rather, all of the archaeological materials discussed below are simply considered Late Archaic. It will be difficult to compare this record to other sites that do not have the same degree of stratigraphic detail. Such comparisons will be made later for the Jayrn site within Ray Roberts. In the meantime, it is important here to consider that the internal stratification of the Gemma site, and the lack of any mixture with younger or older archaeological materials make this the kind of site that is ideal for establishing a cultural stratigraphy for the region. In the descriptions and discussions below, the occupations at the Gemma Site are simply considered in stratigraphic-chronologic order within Block 2, followed by discussion of Block 1, which is only roughly correlated with Block 2. Because excavations in Block 2 were limited to a 1x2m unit below stratum B6, very little is known of the deeper occupation horizons.

Archaeology of Block 2

The Late Archaic living surfaces in Block 2 record a sequence of occupation surfaces, each separated by sterile or nearly sterile alluvium (Figure 8.2). These occupations are registered by abundant features (Table

8.1) as well as lithic artifact assemblages (Tables 8.2-8.5). Numerous faunal remains are discussed later in this chapter.

A total of 2,753 lithic artifacts was recovered from Block 2 (Table 8.2). This number is low, especially in view of the fact that one fourth of each square meter was fine-screened. Overall, artifact densities are very low as well (Table 8.3). Above stratum B7, the highest artifact densities are in Strata B2, A3 and A2. Stratum B5 has a complex of features but low artifact densities. Also of interest are strata such as B6, which has no artifacts, but clear evidence of human occupation in the form of butchered deer bone (see below). Small excavation areas resulted in sampling problems for stratum A1, yet that occupation surface appears to have had moderately high bone densities, and artifact densities greater than in Stratum B5. In general, bone densities track artifact densities. Exceptions include stratum A2, which has low bone density, and B6, which has abundant bones yet no lithic artifacts. Spatial patterning and spatial sampling are probable factors in these "trends and exceptions", although the character of activities and duration of occupations are also viable explanations as well.

Small samples prohibit conclusive description of the technology, although it is clear that for the block total, little tool manufacture took place. Tools and cores are about 2.5% of the assemblage, and over half of those are from stratum B2 and another 23% of the total are from Stratum A2. Lithic raw materials are dominated by Ogallala quartzite (Table 8.4). A few pieces of other local quartzite, and a few pieces of local petrified wood are included in the "quartzite" category. The two cores from A2 are both made of very small (less than 2.5 cm) milk quartz pebbles of local origin. All of the blank-preforms are made of Ogallala quartzite. Interestingly, a cluster of ca. 820 chert chips and flakes from stratum A3 appear to be from the same blank(s), made of a gray regional chert streamworn cobble/blank. No preform of this material was found, but a nearby point is of the same material. Other than this, it appears that almost all on-site tool manufacture employed use of immediately available materials.

There are obvious differences in raw material use among the occupation horizons. Chert debitage ranges from 17-26% in Stratum B, and from 35-86% in Stratum A, excluding the sample of 4 pieces from A1 (Table 8.4). All of the cherts appear to be regional, probably from the region west and southwest, corresponding to cherts from the West Fork Trinity Valley and possibly from gravels associated with the Brazos drainage (Banks, 1990). Sources along the Red River are also possible, but no Edwards or other definitive chert types are apparent. Cortex on almost all chert pieces is streamworn. Although samples are very small, the upward increase in chert is also reflected in tool raw materials (Table 8.5). All of the points and retouched tools in Strata A3 and A2 are chert. In Stratum B2, 33% of the points and retouched tools are chert. Local quartzites are dominant among blanks and nondiagnostic biface fragments. This pattern suggests: a) use of local materials for reduction strategies including initial stages of reduction, and b) importation and curation of chert tools and/or chert blanks for tools. Lithic sources for tool blanks may have been regional chert outcrops (including upland gravel deposits) or perhaps pieces scavenged from nearby older sites, as discussed in the synthesis for this volume.

Except for the cluster in A3 mentioned above, most chert debitage is probably related to tool maintenance and repair, rather than tool manufacture. Through time, however, chert importation to the site increased. This pattern is significantly <u>within</u> the Late Archaic, in contrast to the general tendency for "Late Archaic" tool (ie., point) collections from the upper Trinity Valley to exhibit a predominance of local raw materials (Prikryl, 1990). As discussed later, the trend for increasing use of regional cherts may have been part of a broader ecological response to changing biotic resource availabilities.

Among the non-debitage artifacts, almost half are projectile points (Tables 8.2, 8.5). Retouched tools are few, and are mainly typical endscrapers or sidescrapers made of chert. Given the paucity of cores (neither of which is chert), and the small size of most debitage, it seems likely that chert unifacial tools were imported to the site as finished tools or as large flake blanks. Quartzite debitage was undoubtedly used for tasks such as cutting, but retouched pieces are rare. Evidence of biface manufacture is clear in Stratum B2, which yielded 8 quartzite blank-preforms. Even for quartzite pieces, however, the frequency of cortical debitage is very low (Table 8.4), suggesting some off-site preparation of blanks. Biface manufacture is also evidenced by the cluster

Table 8.1 FEATURE ATTRIBUTES AND CONTENTS - 41CO150

FEATURE	Elev cm-bd	AREA (cm)	DEPTH	TYPE	CONTENTS
A1.1	114	125x135+	29+	H.-rl.	FCR; bone, shell, little baked clay.
A1.2	112	43x40	16	H.-rl.	FCR; shell, bone, preform.
A1.3	111	135x105	7	H.-rl.	FCR; shell, bone, charcoal; baked clay.
A2.1	173	180x100	25	H-u.+ refuse	bone, shell, FCR.
A2.2	175	120x80+	14	H.-rl.	FCR; baked clay, bone, flake.
A3.1	207	280+x240+	10	Shell	mussel shell, deer bone, debitage.
A4.1	239	300+x230	15	H.cl.	multiple unlined hearths; burned clay bone, FCR.
A5.1	254	320+x145+	8	Shell, H.-u.	mussel shell; includes hearth with baked clay; charcoal in center.
B2.1	310	142x58	20	H.-u	ash, baked clay, burned bone, unburned shell, deer antlers.
B2.2	307	145x90	13	H.-rl.	FCR, ash, + bone in upper lens, shell in lower lens.
B2.3	313	52x38	6	H.-cl.	lined with baked clay; ash, charcoal.
B2.4	310	70+x46	20	H-u.	burned clay, ash, charcoal, shell, debitage, dart point, FCR, antler, cobble.
B2.5	312	80+x48+	11	H-u.	ash, burned clay, bone, rare FCR, shell.
B2.6	311	100x80	12	H.-u.	ash, burned clay, shell, rare FCR.
B2.7	310	84x32	12	H.-u.	ash, charcoal, burned clay; deer ribs, shell.
B2.8	315	100x55	15	H.-u.	ash, charcoal, burned clay; shell, bone, dart point.
B2.9	319	160x65	11	H.-cl.	lined with baked clay; ash, charcoal, shell, bone, debitage, dart point, bone.
B2.10	316	35x28	7	Knapping Area	debitage, dart point, scrapers, bone; little FCR.
B2.11	324	100x103	16	H.-u.	lined with baked clay; ash, charcoal, shell, bone, dart point, little FCR.
B2.12	303	53x18+	10	H.-u.	burned clay, ash; shell, little FCR.
B2.13	308	42x24	10	H. rl.	FCR, burned clay, +charcoal; shell, bone, debitage.

Table 8.1, cont.

B2.14	301	340x68+	10	H.-rl.	FCR, bone, shell, debitage, central basin with charcoal.
B2.15	312	50x50	25	H.-rcl.	lined with baked clay, FCR; ash, shell, bone, debitage.
B2.16	295	82x55	9	H.-u.	lined with baked clay, ash, charcoal, rare FCR; little bone, shell.
B3.1	330	72x75	24	H.-u.	ash, burned bone, shell, little FCR.
B3.2	302	140x65	17	H.-rl.	FCR, charcoal, shell, some bone.
B3.3	344	50x30	11	H.-u.	ash, burned clay, little shell.
B3.4	325	40x28	11	H.-cl.	ash, shell, charcoal.
B3.5	314	90x75	10	H.-u.	charcoal, little FCR, ochre.
B3.6	321	40+x25	10	H.-rl.	FCR, charcoal.
B3.7	323	120x88	8	H.-rl.	FCR, shell, charcoal.
B4.1	341	68x30+	13	H.-rl.	ash, charcoal, baked clay.
B4.2	344	34x20	10	H.-ul.	ash, charcoal, burned clay, little FCR; burned bone, shell.
B4.3	326	100x112	9	H.-rl.	FCR, charcoal, turtle frags., some shell.
B5.1	358	65x25	8	H.-u.	ash, baked clay, little charcoal.
B5.2	343	60x45	10	H.-u.	ash, little charcoal and baked clay; little bone and shell.
B5.3	353	175x150	16	H.-rl.	central basin with FCR, charcoal, flanked by several FCR clusters; abundant shell, one broken metate.
B5.4	349	120x75	9	H.-u.	ash, charcoal, little baked clay.
B5.5	350	30x30	25	H.?	baked clay.
B5.6	340	50x30	26	H.-rl.	FCR, charcoal.
B6.1	368	208x144	24	Butchering area	deer bone, little shell, debitage.

HEARTH TYPE KEY:
H - hearth u - unlined cl- clay lined rl- rock lined FCR- fire-cracked rock

Table 8.2 ASSEMBLAGE COMPOSITION, CO150, BLOCK 2

LEVEL	DEB	CORES	BLANKS	UNIFACE	POINTS	GRNDST	TOTAL
A1	4		1		1		6
A2	167	2	2	3	7		181
A3	1020			3	5		1028
A4	10						10
A5	0						0
							0
B1	58						58
B2	1306		12	7	14	2	1341
B3	55				1		56
B4	11						11
B5	58		1	1	1	1	62
B6							0
B7							0
B8							0
B9							0
B10							0
Total	2689	2	16	14	29	3	2753
%	97.675	0.07	0.58	0.51	1.05	0.11	

Table 8.3 ARTIFACT DENSITIES, CO150, BLOCK 2

level	debden (n/m3)	artden (n/m3)	boneden (n/m3)	burned %	mussden (gm/m3)	rockden (gm/m3)
A1	2.67	4.00	155.33	45.92	246.00	11890.00
A2	39.23	45.00	11.54	0.00	1798.85	5080.00
A3	160.00	162.76	601.72	34.50	2051.38	2206.21
A4	4.17	4.17	131.67	24.68	168.33	2022.08
A5	0.00	0.00	80.48	25.74	1131.43	1326.43
B1	1.83	1.83	146.83	15.21	429.33	954.50
B2	63.67	69.50	912.33	30.07	2126.67	11430.50
B3	2.33	2.50	139.67	25.42	1110.17	6135.50
B4	0.17	0.17	96.50	23.83	318.33	3003.67
B5	1.67	2.33	322.17	50.54	1987.83	19028.00
B6	0.00	0.00	404.17	13.65	0.00	1.33
B7	0.00	0.00	5.00	100.00	420.00	20800.00
B8	0.00	0.00	235.00	8.51	110.00	30.00
B9	0.00	0.00	130.00	0.00	20.00	390.00
B10	0.00	0.00	875.00	4.57	1310.00	3635.00
Mean	25.07	26.57	272.95	26.84	1033.48	5734.38
Std Dev	41.76	42.97	282.26	24.42	776.51	6576.30

Table 8.4 DEBITAGE, CO150, BLOCK 2

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
A1	55	3	3	2	12				75	0.16	0.07	0.07
A2	105	3	11	5	514	3	13	3	657	0.81	0.02	0.05
A3	50	1	8	6	334	16	27	17	459	0.86	0.09	0.13
A4	3				2	2	1	2	10	0.70	0.40	0.30
B1	36	1	6		15				58	0.26	0.02	0.10
B2	764	30	158	75	206	5	50	18	1306	0.21	0.10	0.23
B3	35		7	1	11		1		55	0.22	0.02	0.16
B4	8		1		1		1		11	0.18	0.00	0.18
B5	39		3	6	10				58	0.17	0.10	0.16

Table 8.5 ARTIFACT TYPOLOGY, CO150, BLOCK 2
(x/x = chert/quartzite)

CLASS/Type	L E V E L					
	A1	A2	A3	B2	B3	B5
BIFACES						
Dart point	-/1	5/2	5/-	3/11	1/-	-/1
UNIFACES						
Endscraper				1/-		
End scraper+denticulate		1/-				
Thick circular scraper			1/-			
Side scraper		1/-		1/1		
Retouch, unilateral			1/-	2/2		
Retouch, bilateral		1/-	1/-			
Chopper						1
BLANKS						
Blank-preform	-/1			-/8		-/1
Biface fragment		2/-		3/1		
CORES						
Single platform flake		-/1				
Opposed platform flake		-/1				
GROUND STONE						
Metate				1		1
Pitted stone				1		
Total	2	14	8	34	1	5
% Chert, chipped stone	0	71	100	25	100	0

(<1m^2) of ca. 820 chert flakes and chips in Stratum A3. The high artifact densities associated with Strata A3 and B2 are largely a consequence of tool manufacture activities. At the same time it is important to note that these strata also have high bone and mussel densities (Table 8.3). Thus, occupation intensity appears to be reflected in overall activity differentiation, which is probably defined mainly by the amount and diversity of food resources procured and processed during the occupation interval.

Most of the projectile points from this block are complete (Figure 8.8). Several from B2 exhibit basal fractures suggestive of breakage in a hafted position, rather than distal impact-related fractures (but note impact fracture on one piece [Figure 8.8, No B2-i]). This suggests that repair-replacement of armature was not a primary focus for lithic processing in Stratum B2. Indeed many of the bifacial tools in B2 appear to have been heavily resharpened, broken in a haft, or in one case (Figure 8.8, No. B2-g), resharpened with a burin blow. These patterns suggest use as knives or borers preceded discard. This contrasts with bifacial tools from Strata A3 and A2, where most of the pieces appear to be projectile points. Overall, this suggests a shift in tool function at the site between these strata, with either fewer or different on-site processing activities involving bifacial tools in the upper horizons. Intensive tool resharpening is also a probable factor in the "atypical" character of the biface typology in Stratum B2, which has several quartzite "projectile points" that are much like thick drills (Figure 8.8, Nos. B2- b-e). By contrast, the chert points from Stratum A3 are all thin and have no evidence of resharpening. Ground stone is represented by only three specimens, including a broken and scattered metate in Stratum B5, and a metate fragment and a pitted stone from Stratum B2. The metates are made of local sandstone and the pitted stone is made on an Ogallala quartzite cobble.

Rapid sedimentation and deep burial not only preserved the spatial patterning of occupation surfaces here, but also left a well-stratified record of tool assemblages. The projectile point assemblages provide insight into variability in late Archaic typological patterns (Tables 8.6). Of the 23 typed pieces, only 7 are Gary types, despite the high frequency of this type in local late Archaic collections (Prikryl 1990). Gary points are absent from the small sample in Stratum A3, which has only Ellis-Ensor and one Godley type (Figure 8.8). Points in the Godley-Yarborough shape range are present at the beginning and end of occupations here, and basal or stem grinding is as well (Figures 8.8, 8.17). The rather crude appearance of quartzite point forms in Stratum B2 is attributed to functional parameters and heavy resharpening. Unless we allude to scavenging, the association of types at the site should be considered evidence for their contemporaneity. If so, then types such as Trinity and Yarborough may be later than previously suspected, and overall variability in point styles is high within this period of the late Archaic. Considerable stylistic variation between occupation horizons here, coupled with changes in raw material use, suggest both functional and cultural parameters were quite variable.

Spatial Patterning and Features

The combination of repeated occupations in a rapidly aggrading sedimentary environment resulted in a remarkable series of stratified occupation surfaces in Block 2. Here only the principal occupation surfaces are described. A total of 44 features were recognized during excavations (Table 8.1). In a real sense this number easily could have been inflated if each bone/shell cluster or small/light scatter of debitage or burned clay had been counted as a feature. Clearly, these occupation surfaces register numerous discrete areas of primary activities and presumably areas of secondary deposition (discard or scattering) of food or hearth refuse.

The majority of the features defined are unlined or clay-lined hearths. These vary in size and depth, and diffuse scatters of burned clay are common in most of the occupation horizons. Nonetheless, those defined as features are clearly discrete hearths. In a less favorable sedimentary environment, either with slow deposition or in sandy sediments, these features would probably not be recognizable. In the feature diagrams, the unlined hearths are shown with fine stippling, while the clay-lined hearths are shown in gray. The latter had greater amounts of clay around their peripheries, suggesting more pit preparation and/or more intensive burning. In general, the unlined and clay-lined hearths have moderate to low amounts of charcoal, but common ash, probably reflecting complete burning of fuel in shallow pits with good air circulation. Rock-lined hearths are also present, but are less frequent than unlined hearths. The rock-lined hearths overlap with unlined hearths in both area and depth, but tend to have more charcoal. Rocks used are dominated by local limestone, although local sandstone was used as well.

Table 8.6 PROJECTILE POINT TYPOLOGY, CO150, BLOCK 2

TYPE	LEVEL					
	A1	A2	A3	B2	B3	B5
Gary		2/1*		-/4		
Ellis		1/-	2/-			
Ensor		1/-	2/-			
Ensor/Marcos(?)		-/1	1/-			
Godley				-/2		
Darl				1/-		
Trinity				1/-		
Yarborough						-/1
Untyped				-/3		
Indeterminate	-/1	1/-		1/2	1/-	
Total	1	7	5	14	1	1
% Chert	0	71	100	21	100	0

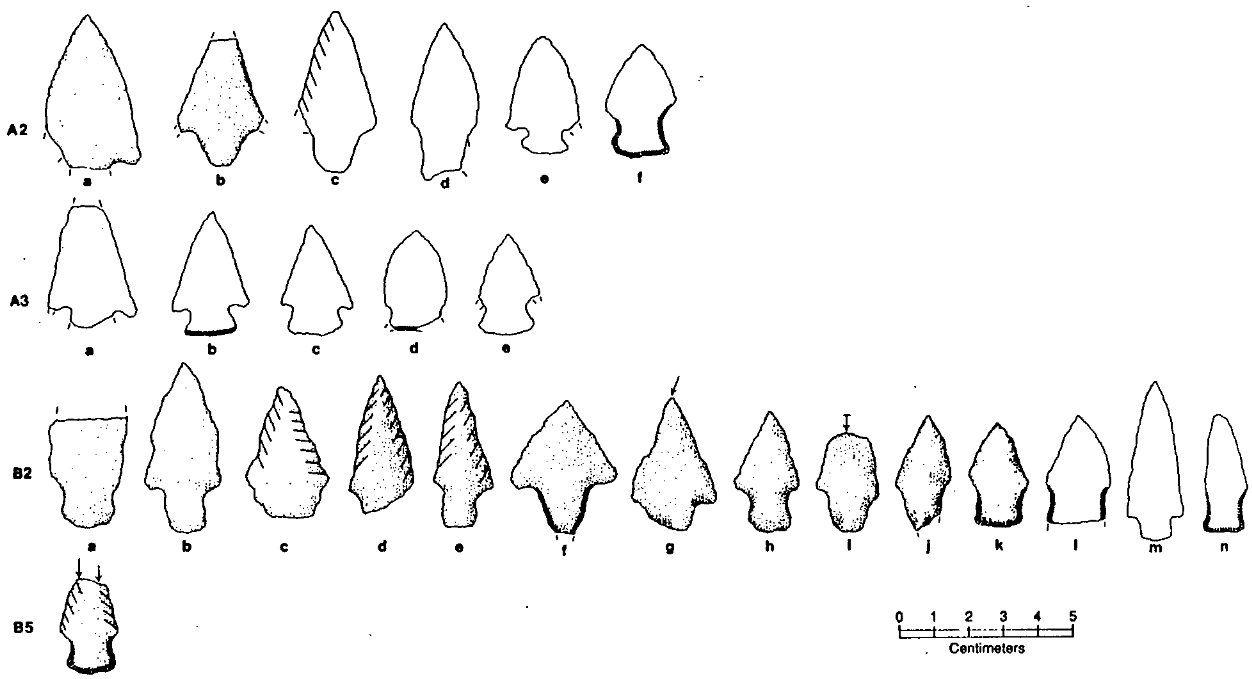


Figure 8.8 Projectile points from CO150, Block 2. Note patterns: open = chert; stippled = quartzite; shading = edge grinding; hachured lines = bevelling from resharpening; plain arrow = burin blow; blunt arrow = impact fracture.

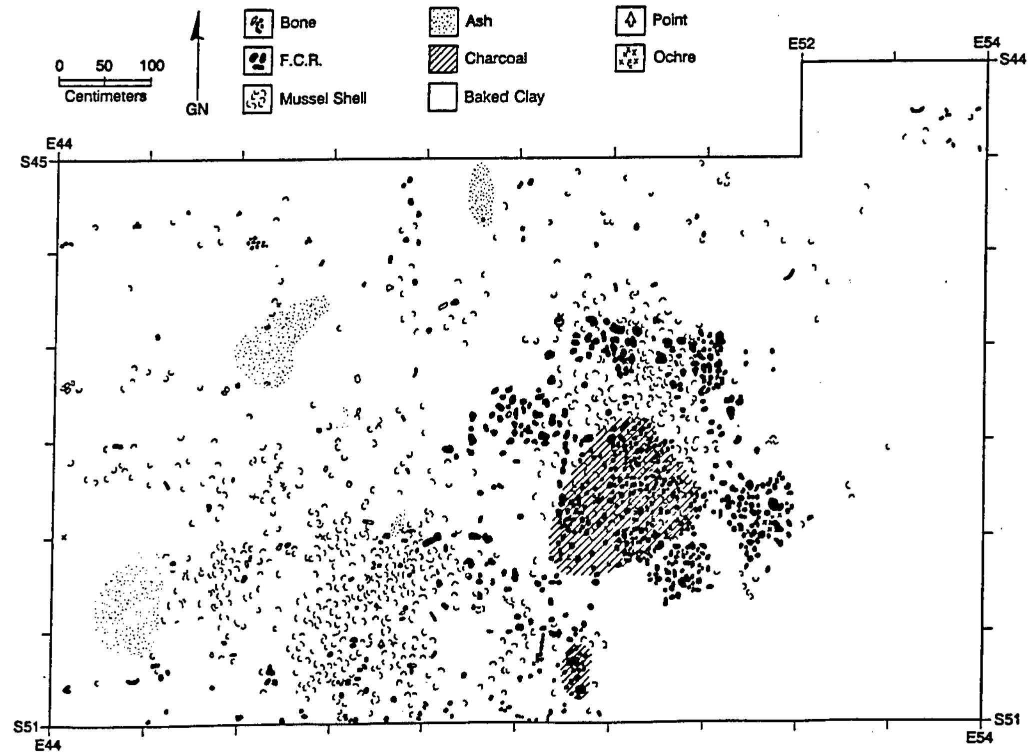
Of principal concern in the description and interpretation of these features and spatial records are the character and spatial arrangement of activities and their implications with respect to occupational periodicity and intensity (duration). While we describe the strata here as "occupation surfaces" determination of the number of occupation episodes per surface must be addressed within these geologically defined stratigraphic contexts (Ferring, 1984). Sampling errors are a potential and important problem here. The 60 m^2 block obviously exposed only parts of occupation surfaces. While individual features and many activity areas are fully exposed, many were partially exposed. More important, this block was not large enough to clearly define a given occupation unit (Ferring, 1984). Thus our perspective on the total range of activities, features and assemblage composition for any occupation surface is potentially biased, perhaps to a great degree. Much wider excavations would have been ideal, but not feasible. Our strategy was to budget for maximum exposure of as many surfaces as possible rather than attain large exposures only for the shallow surfaces.

Stratum B6 is the deepest full stratum exposed. This surface yielded no artifacts, yet human activity is clearly indicated by butchering marks on deer bone found in the cluster in the middle of the block. Bone processing is discussed later, but this may be a specialized area of faunal processing associated with other unexcavated activity areas.

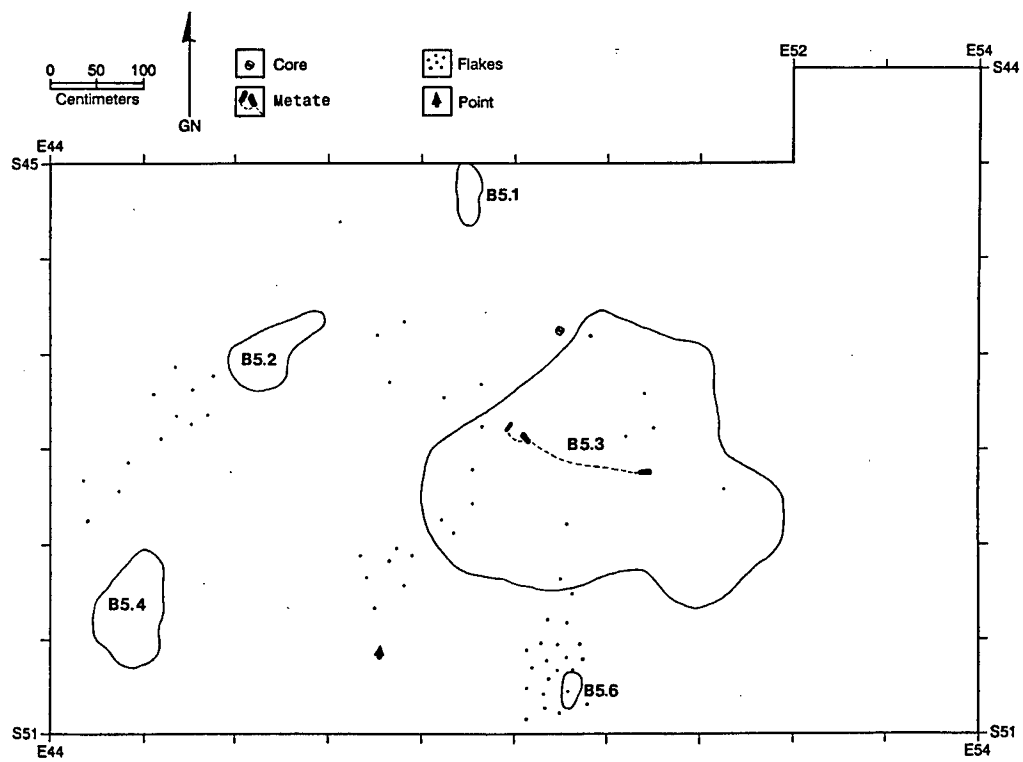
Stratum B5 contains a series of features and artifact clusters that denote a probable single occupation (Figure 8.9). A remarkable feature complex in the center of the block registers cooking activities that are interpreted as focused on basket boiling. The central hearth pit is filled with ash and charcoal along with burned rocks. Peripheral to this are five discrete clusters of burned rocks that have no associated charcoal or ash. These are interpreted as the dumpings from boiling of food in baskets. Associated with this feature are clusters of mussel shells, both in the feature area and to the southwest (Figure 8.10a). A small hearth pit with burned rocks is just south of the main hearth area. Compared to its size, the main hearth feature has a relatively small amount of faunal remains, suggesting that only butchered, meaty portions of game were introduced to the feature area. Other features to the west are unlined hearths that have higher amounts of burned bone and turtle shell. Peripheral to these are numerous remains of turtles and deer. As discussed later, this occupation has little deer bone compared to higher surfaces, and it appears that mussels and turtles were relatively important foods processed in B5. Very little lithic processing is indicated. A single impact-damaged point was found (Figure 8.8, No. B5-a). Near the central hearth was a limestone chopper, perhaps used in mussel processing, and in the hearth area were three fragments of the same simple sandstone metate. Three clusters of debitage were found, two at the periphery of the central hearth, and one to the west between two medium-sized unlined hearths. The majority of this debitage is small interior flakes and chips, presumably related to tool resharpening. Overall, the excavated area of this occupation appears related to a single occupation event, dominated by food preparation and cooking activities. Because the surface was apparently buried before any reoccupation, the central hearth complex was not disturbed, and preserves an important record of hearth-related activities. Notable is the clear segregation of burned rocks in clusters peripheral to the heating basin; this is taken as excellent evidence that the central hearth was used for heating boiling stones. Implicit in this interpretation is that at least five cooking episodes involving dumping of used rocks took place. It cannot be determined whether these were synchronous, implying communal use of the hearth, or if they were serial events. The low density of chipped stone is related primarily to the fact that no tool manufacture appears to have taken place. An additional factor in this regard may be that little processing of deer is evident, suggesting that less tool maintenance would have been required.

Horizon B4 was exposed only over a small area, and this is difficult to stratigraphically distinguish from Stratum B3 because of dipping beds. Only a few pieces of debitage and a small faunal sample were recovered, making interpretations difficult. Three small unlined hearths were associated with this surface (Table 8.1).

Occupation associated with Stratum B3 is marked by rock-lined and unlined hearths, discrete clusters of mussel shells and several small clusters of debitage (Figure 8.10). As in Stratum B5, mussel shell concentrations are peripheral to the hearths, although in this case clusters are associated with both rock-lined and unlined hearths in the eastern part of the block. Deer bone is strongly clustered with the hearths in the northeast part of the block (Figure 8.10c), while faunal remains in other hearth fills are dominated by small game. There are light scatters of burned rock about the hearths in the southeast part of the block. These could



a



b

Figure 8.9 Plan of occupation surface, Stratum B5. a- features, b- debitage and tools.

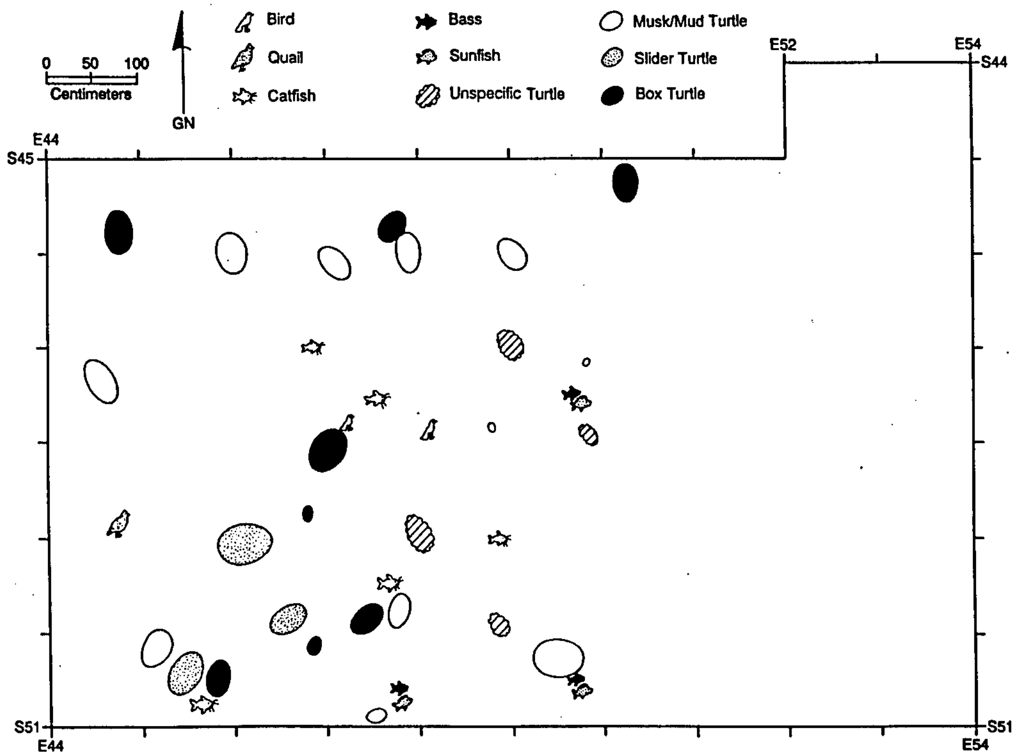


Figure 8.9c Plan of occupation surface, Stratum B5, small game.

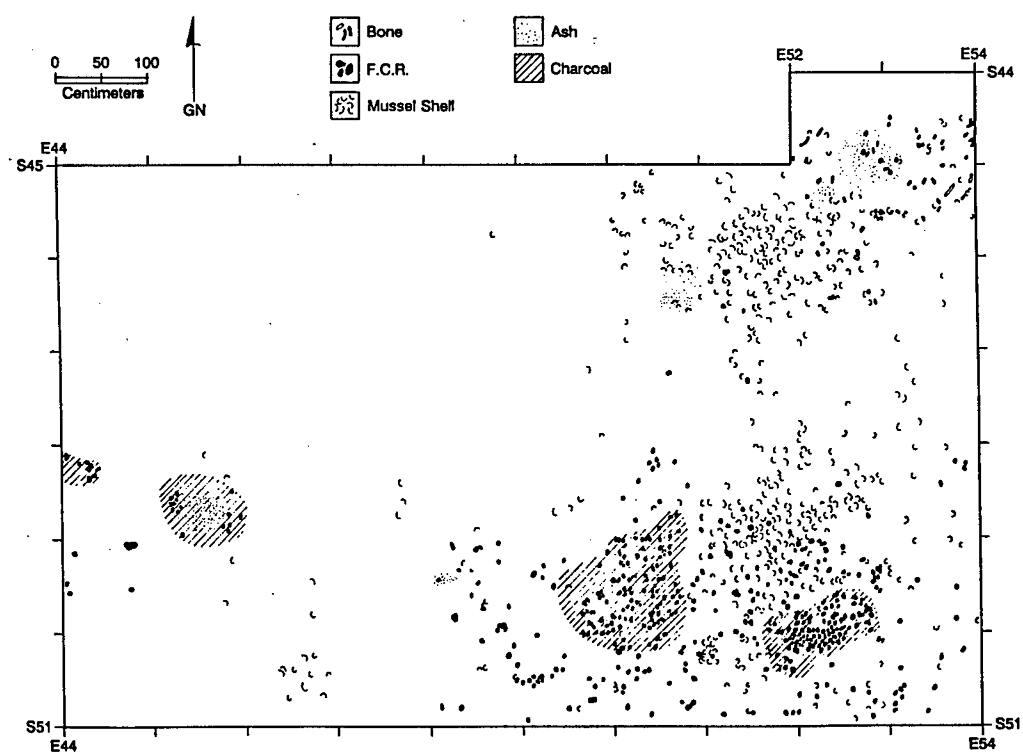


Figure 8.10a Plan of occupation surface, Stratum B3, features.

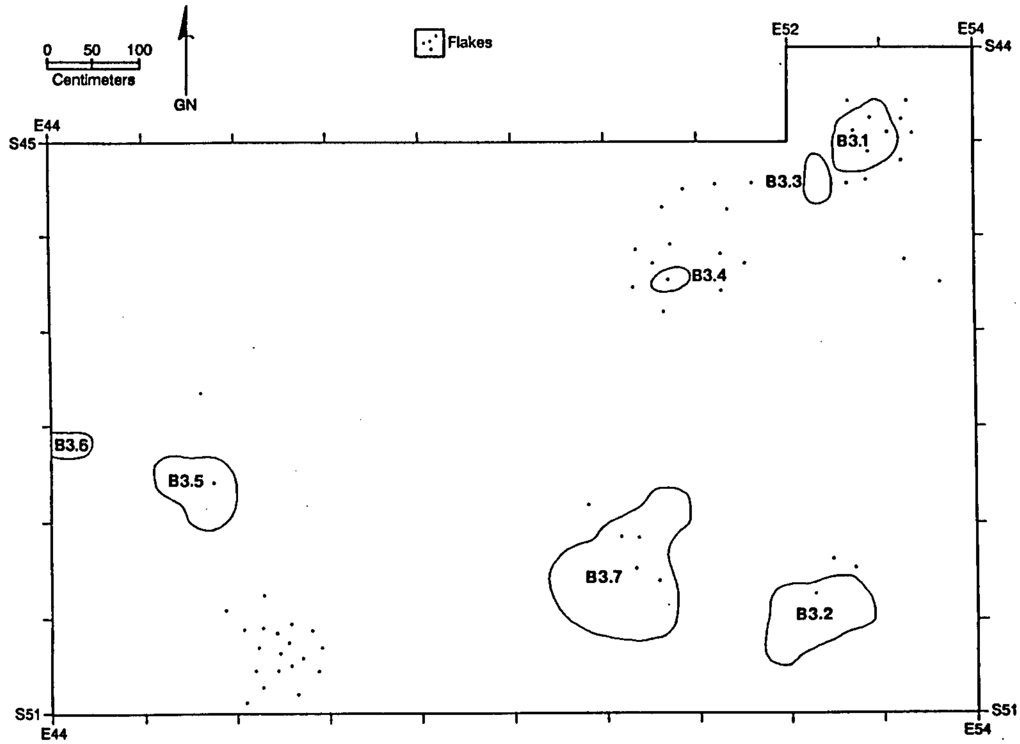


Figure 8.10b Plan of occupation surface, Stratum B3, debitage and tools.

be scattered remains of dumped heating rocks, but the evidence is not as clear as in Stratum B5. Chipped stone is concentrated near hearths except for the cluster in the southwest part of the block (Figure 8.10b). The only tool from this horizon is a chert projectile point fragment. Overall, this horizon appears to represent a probable single occupation of limited duration. It is similar to Stratum B5, albeit with less intensive hearth construction and use. Low artifact and faunal densities (Table 8.3) need to be weighed carefully against the possibility of spatial sampling error.

Stratum B2 contains a high density of features, artifacts and faunal remains (Table 8.3). This density is not explained by surface stability, but rather appears to be the result of occupation patterns. The 16 recognized features fall into two discrete clusters (Figure 8.11a). In the northeastern part of the block is a concentration of unlined hearths that has an association with the highest density of lithic debitage and tools (Figure 8.11b). A single rock-lined hearth is present in the western part of that cluster. Three rock-lined hearths were exposed in the southern part of the block, although the largest one (Feature 16) was only partially revealed. The hearths from this horizon have a considerable range of small game, fish and deer remains in association (Table 8.26). The highest densities of mussel shells are associated with the unlined hearths, with over 750 valves present in the northeastern part of the block; most of these were not mapped in place and do not appear on Figure 8.11a. Another small cluster of mussels is present in the south westernmost part of the block, between hearths there. A clear break in faunal and artifact densities follows the division between the two clusters of hearths. Identifiable deer elements are clearly concentrated in the northeastern area, with the unlined hearths. Another dense deer bone cluster in the northwestern part of the block is dominated by teeth, toes and skull fragments, suggestive of a butchering locus. A cluster of resharpening flakes is present at the northern end of this deer bone cluster. Many fewer deer elements are associated with the hearths in the southern part of the block, although this could have been an area where butchered deer were cooked. Fish, birds and turtles are more common in the northern part of the block.

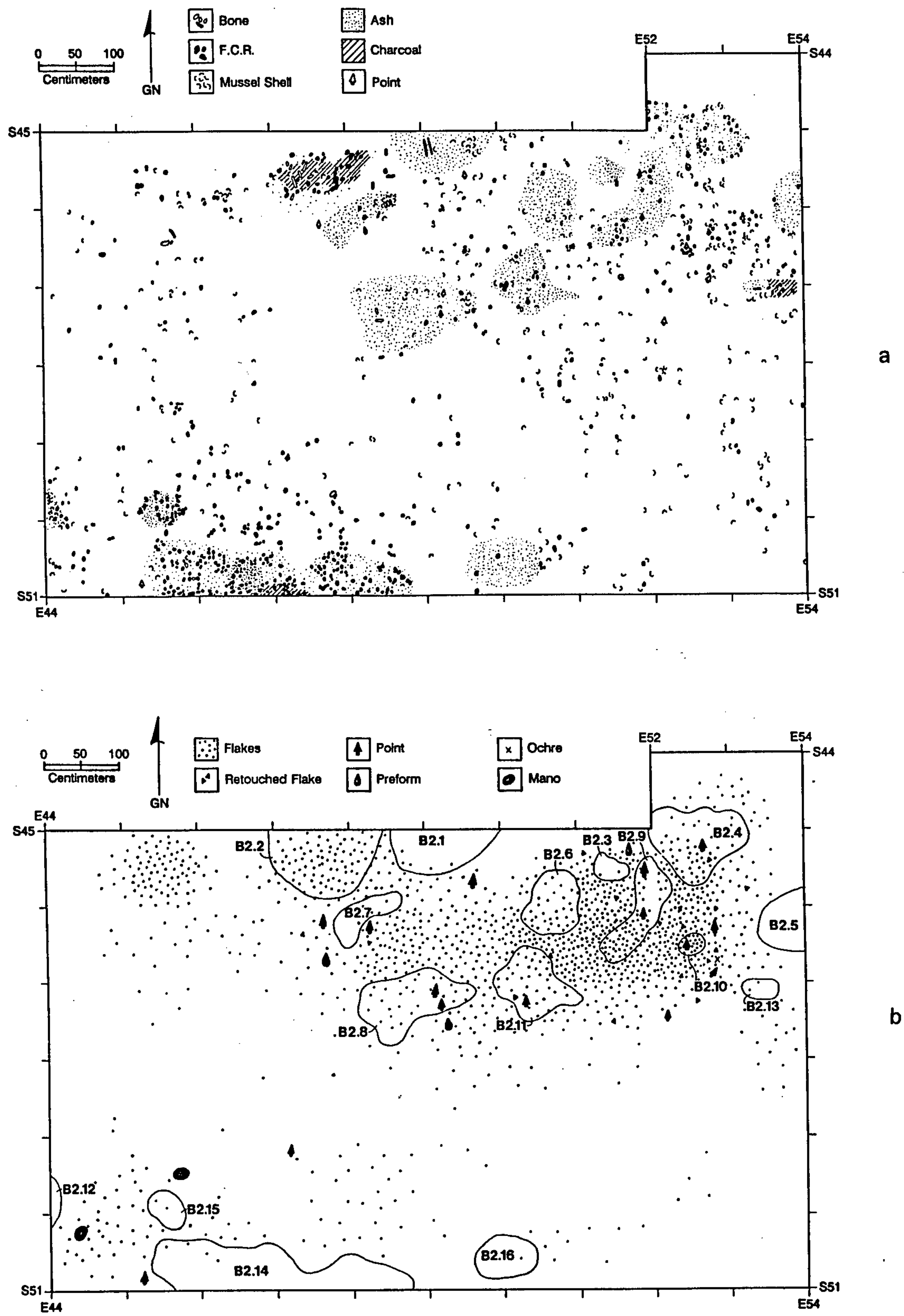


Figure 8.11a Plan of occupation surface, Stratum B2. a- features, b- debitage and tools.

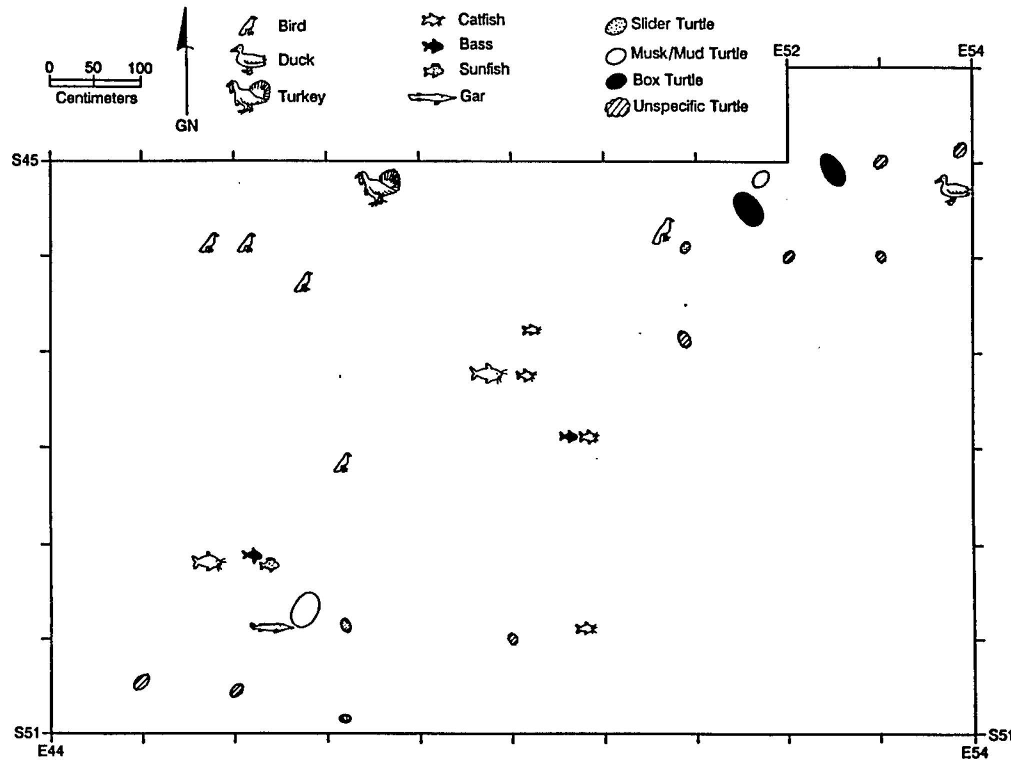


Figure 8.11c Plan of occupation surface, Stratum B2, small game.

The concentration of lithic artifacts associated with the unlined hearth cluster includes debitage, preforms, unifacial tools and all but two of the bifacial tools (Figure 8.11b). This suggests that these hearths were associated with general residential activities, while food preparation and cooking appears to have dominated activities in the southern part of the block. Indeed, the strong clustering of all materials in the northeastern part of the block is suggestive of an architectural confinement of space, although no architectural features were found. Two projectile points, a metate fragment and a pitted stone are associated with the southern hearths. The spatial patterning in this horizon could reflect a single, intensive occupation, or repeated occupations. The lack of overlap among the hearths suggests that they were constructed during one occupation episode, as does the good segregation between the hearth clusters. Construction of multiple hearths in proximity is evident from other horizons at the Gemma site, at the Jayrn Site, and at CO141 (Prikryl, 1987). No artifact refits were made between clusters, but they may exist. A tip from a heavily resharpened bifacial tool (Figure 8.8, No. B2-b) had broken off and was found four meters away in the unlined hearth area.

The lithic assemblage is suggestive of an intensive occupation as well. The 14 bifacial tools exhibit frequent resharpening. Many have very thick cross-sections, heavy beveling and/or basal breaks that suggest damage while hafted (Figure 8.8, B2-c,d,g,j,l). One point has an impact fracture (Figure 8.8, B2-l); other than that none of the characteristic basal fragments associated with point replacement are present. Nonetheless, 12 blank-preforms were recovered, indicating a fair amount of bifacial tool manufacture. Four of the bifacial tools exhibit basal grinding, which also may be indicative of hafted use as cutting implements. The unifacial tools are limited to an endscraper, 2 sidescrapers and 2 retouched pieces. The scrapers are all large and quite heavily retouched.

Stratum B1 appears to preserve a very ephemeral occupation surface, or perhaps only the periphery of a surface. No features were found, and the small sample of debitage is dominated by small interior pieces.

Strata A5 and A4 are both very ephemeral occupation surfaces as well. A5 yielded no artifacts, but had a large concentration of mussel shell and an associated hearth (Table 8.1). Stratum A4 yielded only ten pieces of debitage, but seven of these are chert. This high chert frequency is continued in superjacent strata. A cluster of clay lined hearths was found in A4.

Strata A3 and A2 have significantly higher densities of artifacts and features than found in Strata B1-A4. Compared to Stratum B2, these also record significant changes in artifact typology and raw material procurement. Radiocarbon ages show that A3 is approximately 500-600 years younger than B2, and A2 is between 600-700 years younger.

Stratum A3 has high densities of artifacts, bone and mussel shell (Table 8.3), yet only a few small hearths (Figure 8.12a). A major concentration of mussel shell was found in the center of the block, between two of the hearths. Deer bone are clustered on either side of the mussel concentration. Flintknapping was concentrated in two areas. About 820 chips and flakes were found in a cluster of less than one square meter in the western part of the block, and a smaller cluster of quartzite flakes was found in the east-central part of the block (Figure 8.12b). Both of these are near hearths; as indicated previously, the chert cluster is clearly related to biface manufacture, and the quartzite cluster is apparently a biface reduction area as well. The chert flake cluster accounts for the high artifact density; without that cluster artifact densities here would be almost identical to those in A2. The overall lithic assemblage has 86% chert (regional tan chert with cobble cortex), and has very few cortical flakes (Table 8.4), suggesting that preforms or prepared cores were brought to the site. Two retouched pieces and one thick circular scraper are all made on chert flake blanks (Table 8.5). The projectile points from A3 are all chert, and are all corner-notched to short-stemmed shapes (Figure 8.8). This small point sample is stylistically distinct from that of B2, and is also different from the overlying assemblage from A2 (Figure 8.8).

Stratum A2 has more features and more apparent activity differentiation than A3. There is also a higher density of burned rock, although most of the rock is scattered near hearths rather than in them (Figure 8.13). Deer bone is concentrated in the central part of the excavation area. Debitage occurs in three clusters, two small ones near hearths, and one larger diffuse concentration in the central part of the block. Regional chert constitutes 35% of the debitage sample, which is lower than in A3, but still significantly higher than in Stratum B. The majority of tools are also made of chert (Table 8.5). The latter include a typical endscraper and a typical sidescraper. The projectile points from A2 are stylistically diverse compared to A3, with two Garys, two corner notched forms and two stemmed points (Figure 8.8). It is notable that Gary styles were present in Stratum B2, absent from A3 and recur in A2 (Table 8.6). One specimen from A2 has been beveled by resharpening (Figure 8.8, A2-c).

The sample of materials from Stratum A1 is very small (Table 8.2). Three rock-lined hearths are the reason for the high rock densities (Table 8.3), while bone and mussel densities are moderate to low. Only four pieces of debitage were found, yet a crude, untyped projectile point and a blank-preform were also recovered. Because of the small excavation area, it is difficult to compare A1 to the other strata.

Archaeology of Block 1

Because of the different geologic context, excavation of this block had to be done in arbitrary levels. Therefore the record of occupations is less clear than in Block 2. The main occupation horizon centered about levels 12-13, based on artifact density (Tables 8.7, 8.8) and features. Scattered burned rock and one rock-lined hearth are present in level 12 (Figure 8.14); the hearth continues down into level 13 (Figure 8.15). Other features are small unlined hearths.

The small artifact sample exhibits differences from the assemblages in Block 2. Large debitage and cortical debitage is more common (Table 8.9), and the fluctuating levels of regional chert are more comparable to those seen in Stratum A of Block 2. This, along with the lower artifact density suggests that Block 1 correlates better with the upper part of Block 2, although this cannot be definitely shown. The overall low density of

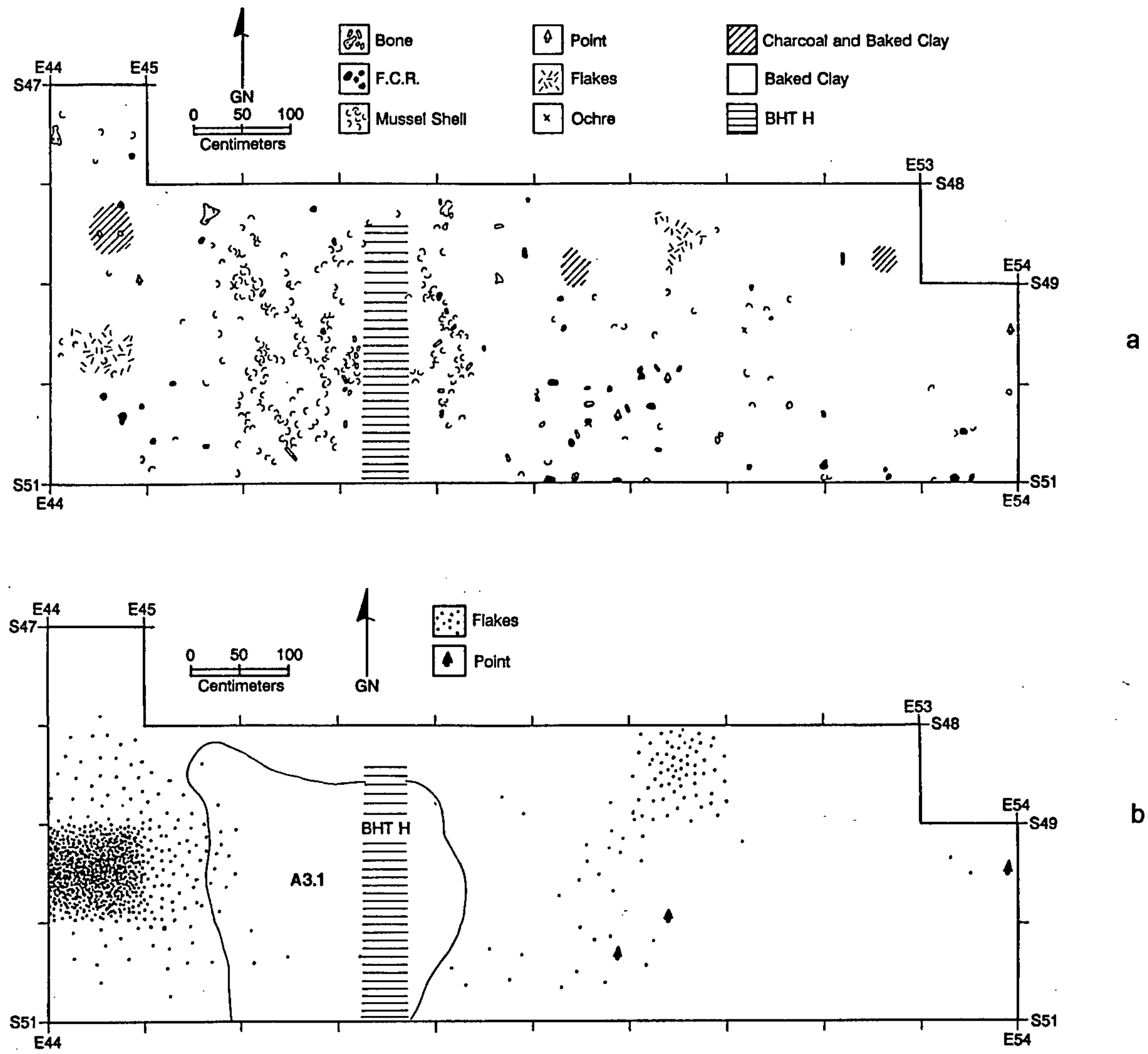


Figure 8.12 Plan of occupation surface, Stratum A3. a- features, b- debitage and tools.

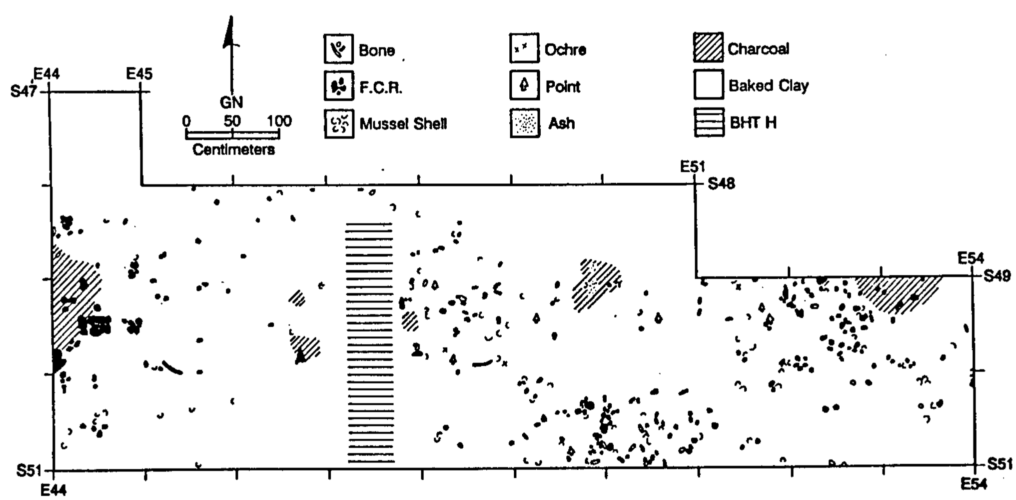


Figure 8.13a Plan of occupation surface, Stratum A2, features.

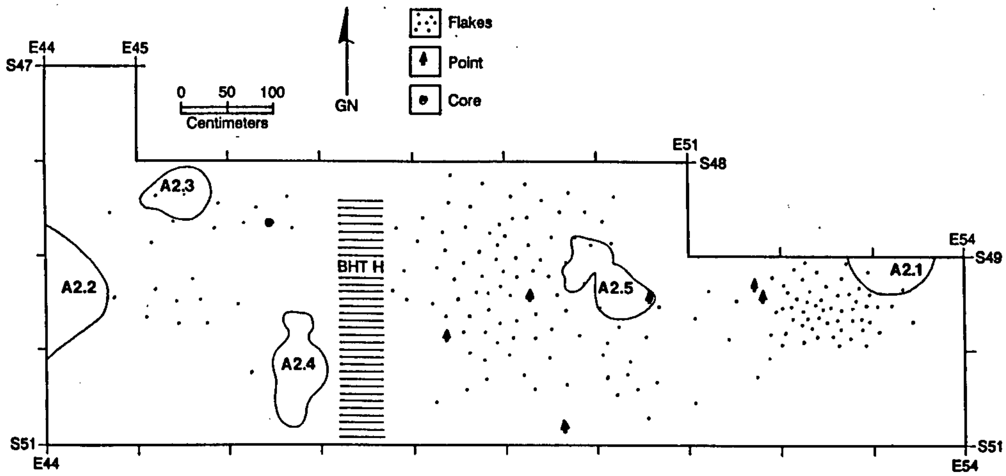


Figure 8.13b Plan of occupation surface, Stratum A2, debitage and tools.

Table 8.7 ASSEMBLAGE COMPOSITION, CO150, BLOCK 1

LEVEL	DEB	BLANKS	UNIFACE	PROJ	GRNDST	N
4	1					1
5	0					0
6	8					8
7	9					9
8	13			1		14
9	4					4
10	11			1		12
11	23	1		1		25
12	61			1		62
13	161	1	2	3		167
14	38	1	4			43
15	19					19
16	18			1		19
Total	366	3	6	8	0	383
Percent	95.56	0.78	1.57	2.09	0.00	

Table 8.8 ARTIFACT DENSITIES, CO150, BLOCK 1

level	% burned	debden (n/m3)	artden (n/m3)	boneden (n/m3)	mussden (gm/m3)	rockden (gm/m3)
6	27.00	2.58	2.58	32.25	212.83	739.76
7	28.57	1.61	1.61	40.63	298.94	1728.47
8	40.18	4.20	4.20	36.22	192.76	3193.08
9	32.65	0.65	0.65	15.85	32.99	3135.83
10	23.74	3.56	3.88	70.83	54.98	576.65
11	23.36	4.85	5.50	113.52	126.13	1847.67
12	35.16	11.97	12.29	147.15	219.92	1717.66
13	17.12	24.26	26.84	383.57	295.28	1910.41
14	25.41	5.17	6.47	119.66	142.30	1351.88
15	26.32	5.50	5.50	30.72	140.69	1163.00
16	21.74	4.53	4.85	22.32	105.76	565.01
Mean	27.39	6.26	6.76	92.07	165.69	1629.95
Std Dev	6.22	6.33	6.99	101.56	83.47	862.65

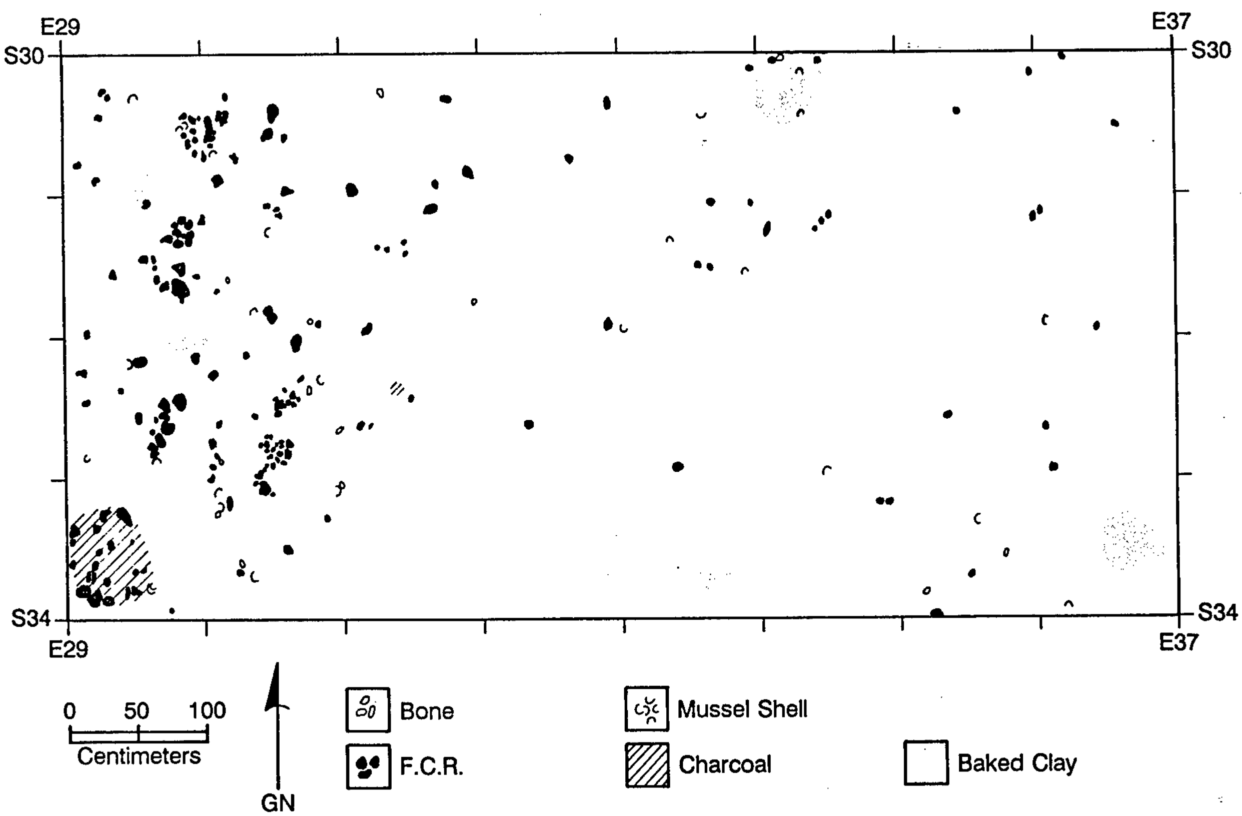


Figure 8.14 Plan of features, Block 1, level 12.

Table 8.9 DEBITAGE, CO150, BLOCK 1

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
Level	INT	CTX	INT	CTX	INT	CTX	INT	CTX	N	Chert %	Cortex %	Large %
6	2	2		2	1	1			8	0.25	0.63	0.25
7	1	1	2		3				7	0.43	0.14	0.29
8	2	1		3	3		2		11	0.45	0.36	0.45
9	2		1	3					6	0.00	0.50	0.67
10	3	3	4	1					11	0.00	0.36	0.45
11	8	1	3	1	3		2	1	19	0.32	0.16	0.37
12	11	7	6	6	15		2		47	0.36	0.28	0.30
13	52	8	8	6	32		1	1	108	0.31	0.14	0.15
14	16	1	2		5		1		25	0.24	0.04	0.12
15	7	1	4		4		1		17	0.29	0.06	0.29
16	3	1			8	1	1		14	0.71	0.14	0.07

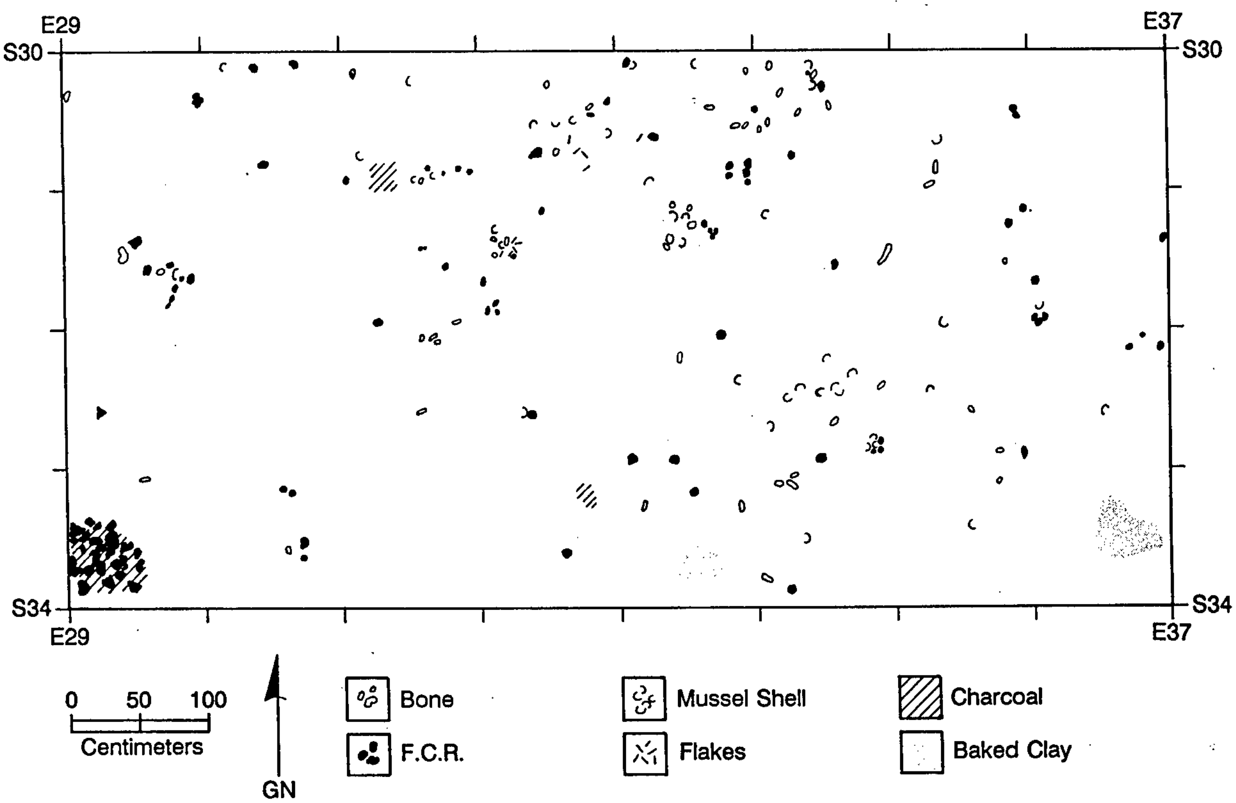


Figure 8.15 Plan of features, Block 1, level 13.

Table 8.10 ARTIFACT TYPOLOGY, CO150, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	LEVEL						
	8	10	11	12	13	14	16
BIFACES							
Dart point	-/1	-/1	1/-	1/-	2/1		1/-
UNIFACES							
Endscraper					1/-	-/1	
Sidescraper						1/-	
Retouch, unilateral						1/1	
Retouch, bilateral					1/-		
BLANKS							
Blank-preform					-/1	-/1	
Biface fragment			-/1				
Total	1	1	2	1	6	5	1
% Chert, chipped stone	0	0	50	100	67	40	100

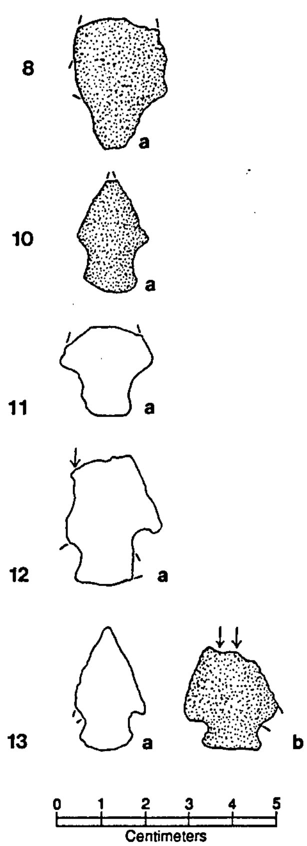


Figure 8.16 Projectile points from CO150, Block 1. See Figure 8.8 for symbol legend.

Table 8.11 PROJECTILE POINT TYPOLOGY, CO150, BLOCK 1
(x/x = chert/quartzite)

	LEVEL					
TYPE	8	10	11	12	13	16
Gary	-/1					
Godley		-/1	1/-		1/-	
Ensor(?)				1/-		
Ellis					-/1	
Indeterminate						1/-

materials in Block 1 illustrates the preference for occupation of the cut off channel, since the truncated surface in Block 1 was available for occupation throughout the occupations revealed in Block 2. Perhaps occupations in the area of Block 1 were only manifested once the cut off channel had been largely filled. But the artifact, bone and mussel densities of Block 1 are less than expected if this part of the site had been the locus of many repeated occupations.

Typologically, the Block 1 assemblages are compatible with those from Stratum A in Block 2 (Tables 8.10, 8.11; Figure 8.16). Despite the higher frequencies of cortical elements, there are few blank-preforms and no cores, indicating a predominance of tool maintenance activities. Chert is the prevalent material for tools, while each of the blank-preforms is made of Ogallala quartzite. Two of the three scrapers are also made of chert, again suggesting importation of tools or tool blanks.

ZOOARCHAEOLOGY

Block 1

Almost 5,000 pieces of bone were recorded for Block 1 at 41CO150 (Table 8.12), which accounts for 8% of all of the faunal remains from the Gemma site. Density of faunal remains was greatest in levels 10 through 14, which produced 83% of the total number of fragments (Figure 8.17), with an occupation surface indicated at level 13. Those same levels generated the highest diversity of taxonomic categories, averaging 15 taxa (Figure 8.18).

Table 8.12
Summary of Faunal Remains, 41CO150[1]

	Total	Identified	Burned
Block 1	4,936	626 (13%)	550 (11%)
Blk 2 Str A	10,333	2,082 (20%)	1,559 (15%)
Blk 2 Str B	45,975	4,833 (11%)	12,712 (28%)
Block 3	21	6 (29%)	4 (19%)
BHTs	64	-	-

[1]Counts include identified elements from surface collections.

Thirteen per cent of the total bones recovered were identified (Figure 8.17). This moderate proportion of identified remains was consistent with the quality of preservation in a matrix that averages a pH 7.0;

furthermore, the quality of preservation or the degree of deterioration tracked the amount of pedogenic calcium carbonate in each level (see Figure 8.5). In Block 1, this condition reflected the slow accumulation of sediments and the fact that the bone was exposed to deteriorating influences for a longer time. Fragmentation was also a factor in the identifiability of the assemblage. For example, the coded sample of deer remains contained no long bones that were more than 25% intact.

Deer remains constituted the primary protein resource in this assemblage. As in the analysis of other sites in which both deer and pronghorn are identified, non-diagnostic post-cranial remains were conservatively assigned to a deer/pronghorn category. Table 8.13 indicates only two elements as pronghorn (level 9), both of which are tooth enamel fragments. The categories of deer and deer/pronghorn were use to evaluate the edible meat contribution and distribution of carcass parts throughout the occupation levels (Figure 8.19). Only levels 13 and 14 contained more than an estimated single individual, and in those levels the impact of numerous identified deer teeth is apparent; otherwise the pattern for level 13 is consistent with what would be expected if an entire carcass were butchered on location (Figure 8.20).

Also in level 13 is evidence of bison. A single petrous is the only element attributed to this animal; the large indeterminate mammal category has nothing comparable to bison. A complete phalanx I was recovered from level 16, but nothing else, therefore, making any interpretation of the importance of bison insubstantial.

Only cottontail, box turtle, and pocket gopher are represented by more than one individual for the entire block; two individuals are estimated for each. Consequently, the contribution of these small game is negligible, but present. The taxa list is not depauperate, however, and points to exploitation of a variety of habitats, including woodland, grassland, riparian, and aquatic. An armadillo scute in level 13 is unquestionably intrusive, which is also probably the case for mole and vole.

The absence of aquatic turtles in level 13 may be evidence of a fall/winter season of occupation, but this assessment is tenuous at best. The degree of vertical mixing of faunal remains is unknown, as is the possibility of aquatic turtle remains recorded as indeterminate turtle. In the absence of deer dental annuli studies, no meaningful seasonality indicators are present.

Five hearth-related features each contained a small amount of faunal remains (Table 8.14).

Table 8.14 Identified Fauna from Features, 41CO150 Block 1

Fea/Lv	Contents (# of elements per taxon)
1/7	1 indet turtle (B), 1 non-ven snake, 1 vole, 1 indet rodent
2/8	1 indet turtle, 1 gopher, 1 med mammal, 3 deer
4/12	1 box turtle, 1 indet turtle, 1 cottontail, 1 sm mammal, 2 d/p
5/13	1 deer
6/13	1 sm mammal, 3 indet turtle (1B), 1 armadillo (intrusive), 3 deer (1B)

Key: Fea = feature; Lv = level; B = burned; d/p = deer/pronghorn category; indet = indeterminate; non-ven = non-venomous snake; size categories: sm (small), med (medium), lg (large).

Bone modification evidence in the faunal assemblage of Block 1 includes skinning/dismembering cuts on deer elements: a carpal in level 7, a tibia in level 15, a humerus in level 16, and three small unidentified fragments (one in level 9 and two in level 14). Three awl fragments were recovered, two from unknown depths in Trench A and a burned midshaft tool fragment from level 10.

Table 8.13 Identified Taxa, CO150, Block 1

	LEVEL												
	4	5	6	7	8	9	10	11	12	13	14	15	16
Bowfin								1					
Indet. Fish										1			
Red-eared Turtle						1					1		
Slider												5	
Musk Turtle				1									
Musk/mud Turtle							1		3				
Box Turtle				3	1	1	1	4	2	9	6		
Indet. Turtle		1	2	11	6	7	29	26	32	69	30	5	3
Non-ven. Snake				1									
Viper					1			4					
Indet. Snake						1	2	1	2	1			
Turkey							1						
Indet. Bird, med									1	1			
Armadillo										1			
Mole						1		1					11
Cottontail				1			1	1	5	5	2		
Jackrabbit									2	1	1		
Swamp/jackrabbit											1		
Gray Squirrel									1				
Tree Squirrel							1		1				
Pocket Gopher					1		2	2	2	1	4	2	1
Woodrat							1						
Cotton Rat					1			1	1	1			
Vole						1				1			1
Indet. Rodent						2	1	1					
Mink				1									
Dog/coyote								1		1	1		
Raccoon									1	1			
Badger										1			
Deer	1		1	8	7	1	3	16	20	42	30	3	2
Pronghorn						2							
Deer/Pronghorn			4	2	3	1	3	10	15	41	15	8	2
Bison										1			1
Indet. Mammal, sm				3			2	2	3	1	3		
Indet. Mammal, med					1	1							
Indet. Mammal, lg			1	1			4		5	1	4	1	
NISP*	1	1	8	32	21	19	52	71	96	180	98	24	21
# of Taxa	1	1	4	10	8	11	14	14	16	19	12	6	7

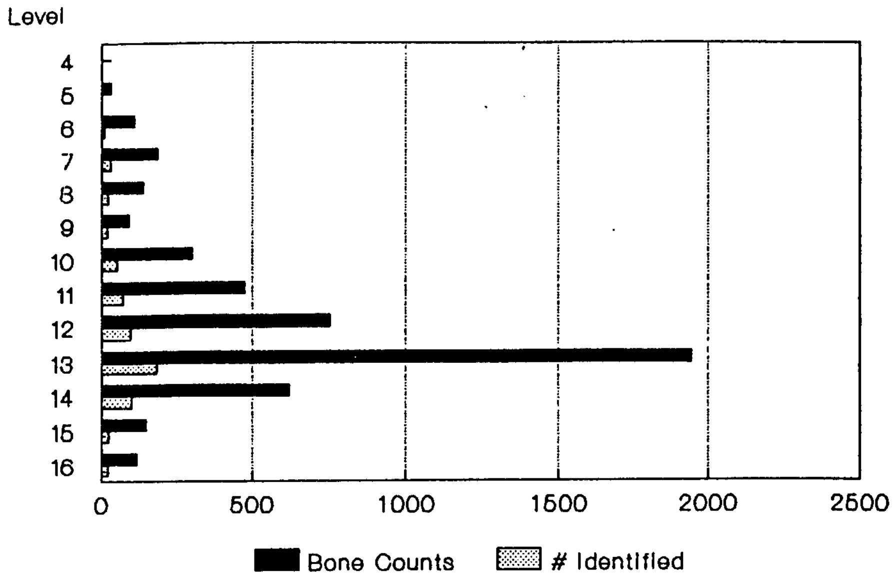


Figure 8.17 Total bone recovered per level, 41CO150, Block 1.

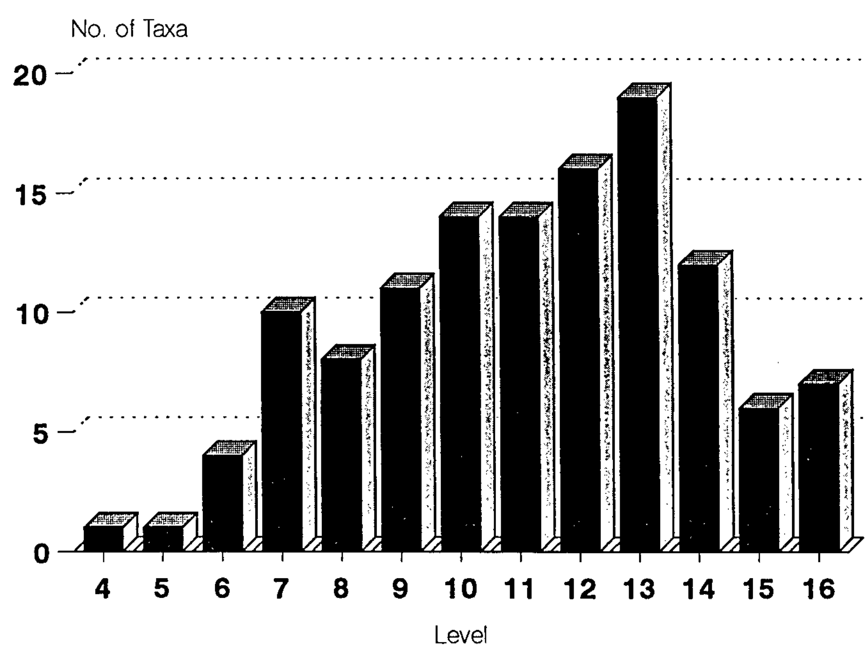
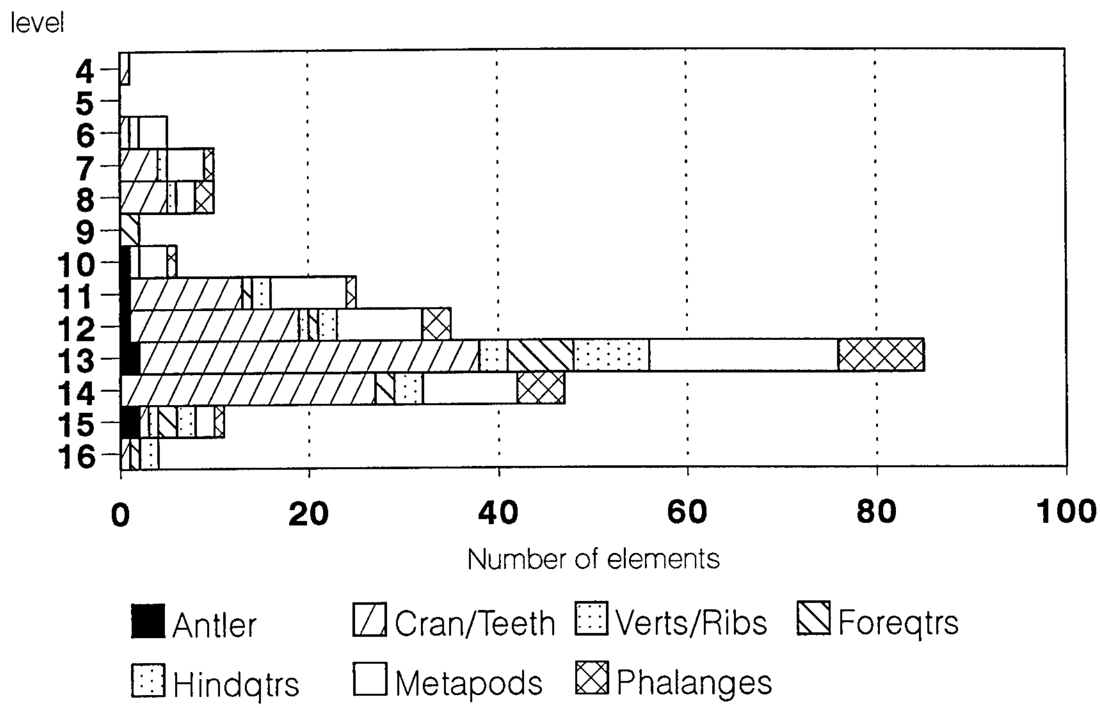
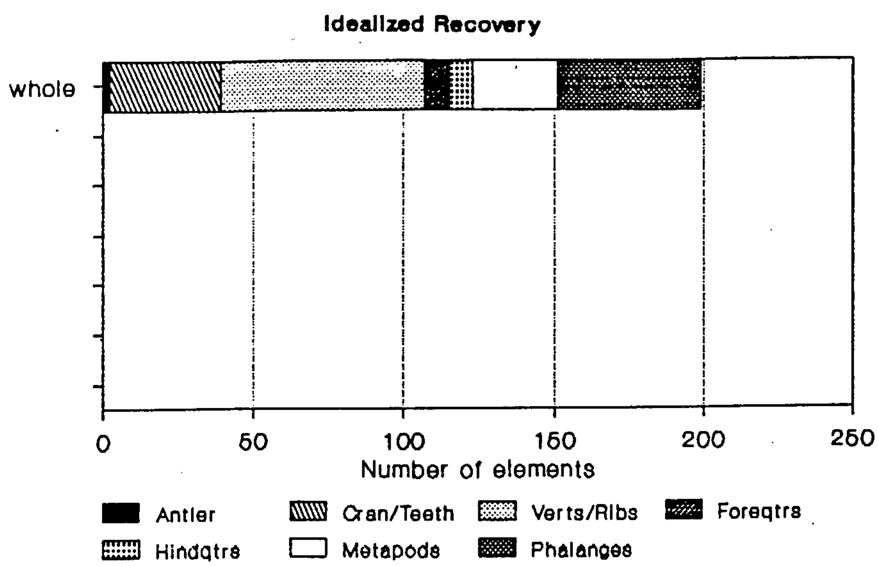


Figure 8.18 Species richness, Block 1, 41CO150.



MNI=2 for levels 13 and 14; only one deer is estimated for other levels.

Figure 8.19 Vertical distribution of deer carcass parts, CO150, Block 1.



Based on number of codes assigned to each grouping.

Figure 8.20 Idealized whole deer carcass recovery.

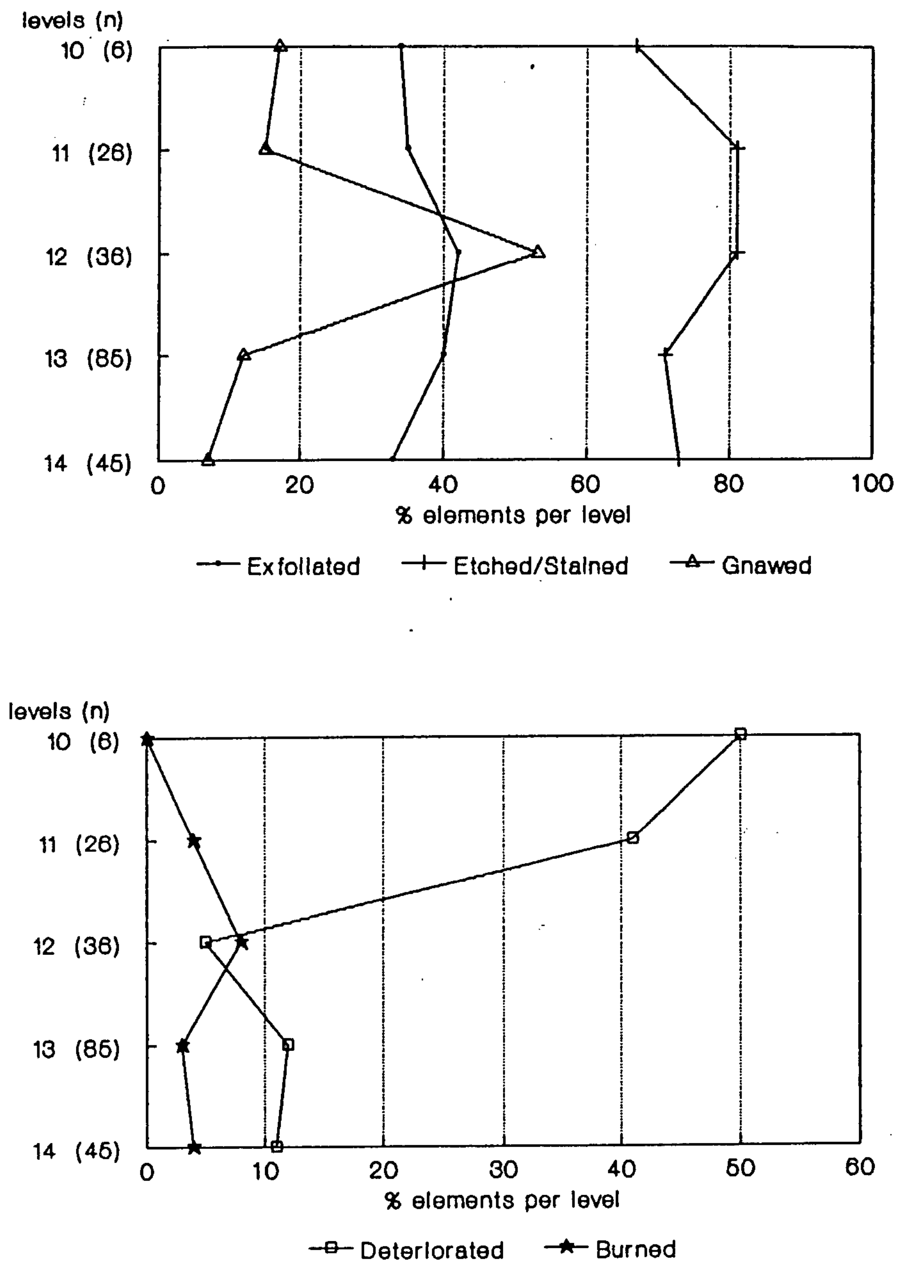


Figure 8.21 Taphonomy of post-cranial deer elements, CO150, Block 1.

Noncultural modification of bone was seen as surficial degradation caused by taphonomic agents such as wet/dry cycles, sunlight, frost, rootlets, soil chemicals, and gnawing animals. In an attempt to identify these agents and track their effects through time, each bone was given a descriptive code to designate its surface appearance and its deviation from fresh, unburied bone. Using post-cranial deer elements, Figure 8.21 shows how groups of these codes can be used to illustrate the taphonomy of the site. Figure 8.21a shows that the deer bone in Block 1 is mostly affected by surface degradation caused by roots or soil chemicals. Except in level 12, gnawing is not a significant factor. Figure 8.21b shows the inverse relationship of burning to highly deteriorated bone; levels A10 and A11 were close to the old ground surface where leaching is most destructive to bone; thus, deterioration is high. Conversely in A12, higher amounts of burned bone ameliorated those effects of leaching; and deeper depth of burial protected the bones in A13 and A14, thus keeping deterioration in check.

Block 2

Two stratigraphic units (A and B) contained occupation horizons in this part of the site. Consequently, the faunas were analyzed by level for each of these units. Unit A, the upper five levels, generated 10,333 bone fragments, with level A2 having 60% of the bone and the highest density (Table 8.3). Unit B, excavated to almost 3 m below surface, produced almost 46,000 faunal remains, most of them coming from level B2 (n=21,663 or 47% of the stratum total), with another dense accumulation in level B5 (n=8,873). Figure 8.22 shows the frequency of bone by level, each of which represents a separate living surface at the Gemma site, and Figure 8.23 displays the number of different taxa per level as an indication of changes in species richness through time.

Stratum A

Over 80% of the animal bones from Stratum A come from levels A2 and A3, with almost two-thirds recovered from A2 alone. The identified species from this stratum are essentially the same as those recovered from Stratum B (Table 8.15), lacking primarily in varieties of fishes, birds, rodents, and medium mammals. Remains of deer, rabbit, and turtle dominate the assemblage. There are at least four individual deer in level A2 and at least two each in levels A1, 3, and 5. The individuals in A2 are estimated from four left lateral malleoli (tarsal), and there is additional evidence of four different ages of deer based on tooth eruption and wear. In level A3, four dental ages are detected, but only two individuals are apparent from the paired element method of determining MNI. At least one of the deer in level A5 is judged to be a fawn less than one month old, and the other is also a juvenile. Distribution of deer elements in level A2 is shown in Figure 8.24, where 222 elements are concentrated.

Two species of rabbits are present in Stratum A, cottontail and jackrabbit. Again, multiple individuals are represented, but only in levels A2 and A3. There are at least two jackrabbits and four cottontails in A2, and two of both species in A3. The only burned rabbit elements come from A2, where three are burned, and A5 has one burned element. These burned elements are all non-meaty elements (teeth and toes), which may suggest discard by incineration or whole-carcass roasting in which only the carcass parts with minimal flesh get exposed to fire.

Turtle shell accounts for roughly two-thirds of the identified remains from Stratum A. While this seemingly skews the relative importance of these remains in the bone counts, it is apparent from the estimated MNI and diversity of turtle taxa that turtle gathering was an important subsistence activity. There are at least twelve individual turtles in the main occupation areas (levels A2 and A3 combined) among three aquatic and one terrestrial genera. Thirteen percent of these remains are burned and associated either directly with hearth features there (Features 4, 5, and 10) or in units adjacent to these features (Table 8.16).

Stratum B

All together, identified elements comprised only 11% of the total bone from Stratum B (Table 8.15). The most frequently coded elements were turtle shell fragments, constituting fully 63% of the identified assemblage of Unit A and 54% of Unit B. Therefore, the total number of identified faunal remains in Block 2 must be considered proportionately small in light of the bias imposed by counting every turtle shell fragment. Nevertheless, the turtle remains are important in many interpretive aspects for either unit.

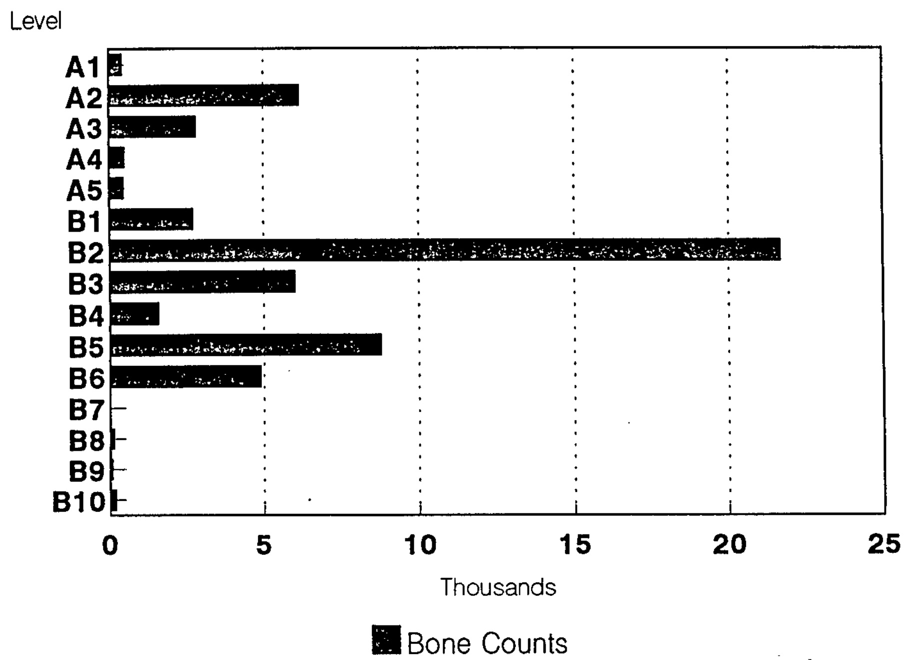


Figure 8.22 Total bone recovered per level, Block 2, 41CO150.

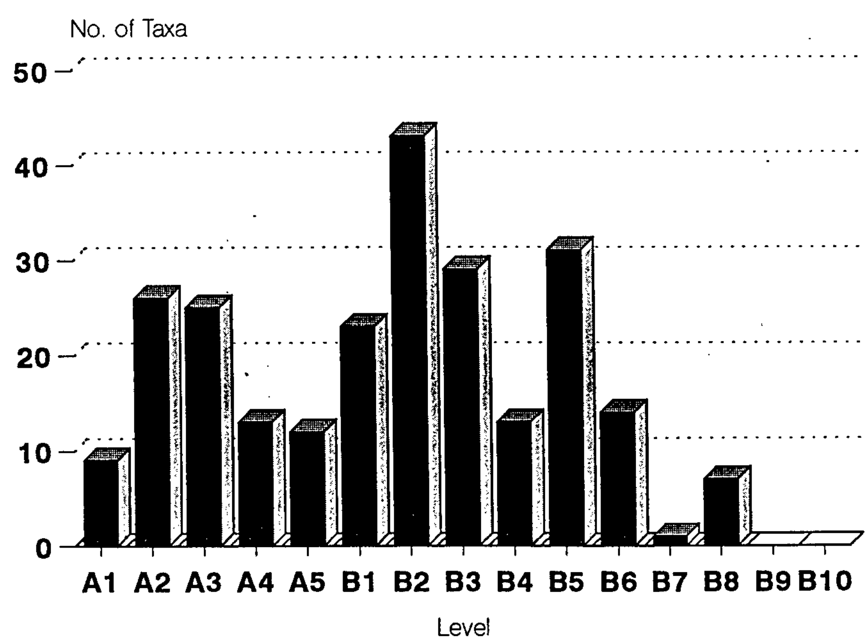


Figure 8.23 Species richness of Block 2, 41CO150.

Table 8.15 Identified Taxa, CO150, Block 2

	LEVEL											
	0	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6
Gar				1		1		1				
Catfish sp.							1	18	3	1	7	
Sunfish sp.								1				
Bass/Sunfish						1		9	1		4	
Indet. Fish	2		1		2	1	6	16	8	9	20	
Frog sp.			2					1				
Toad/Frog	1					1		2			5	
Mud Turtle								93				
Musk Turtle			41	5		6			2	1	74	
Musk/mud Turtle	1		69	22		1						
Red-eared Turtle											1	
Slider Turtle	4	1	22	16				2			115	
Map Turtle				1				10	3	21	304	
Box Turtle	3	22	81	73			1	50	11	6	196	48
Indet. Turtle	24	59	389	281	36	58	46	263	25	151	1156	17
Horned Lizard											1	
Spiny Lizard	116			2							2	
Indet. Lizard	9						1		2		3	
Non-ven. Snake				2	2		6	4	5	10	4	1
Viper			3				3	3		1		
Indet. Snake							2	5	4	10	11	1
Duck								1				
Turkey								9				
Prairie Chicken									1			2
Bobwhite Quail											1	
Indet. Bird, sm							3	6			4	
Indet. Bird, med			1	3	2			14		1		13
Indet. Bird, lg			7	8	1			24			2	4
Cottontail	4	5	115	24	7	1	43	471	87	1	5	9
Jack Rabbit			12	2				6	2		1	20
Swamp/Jack Rabbit	1		8	3			3	7	3			
Beaver							1	7				
Ground Squirrel			19								1	
Tree Squirrel			5	2			10		2			
Pocket Gopher		1		4			1	14	2	4	3	
Pocket Mouse							1	1	1		12	
White-footed Mouse								1	2		1	
Woodrat					1		1	3				
Cotton rat		2	19	1				2			1	
Harvest Mouse			4									
Grasshopper Mouse								1				
Vole			1				12	4	5		1	
Indet. Rodent			11	1	3		9	30	11		9	2
Fox								1				
Dog/Fox			2					1			1	
Raccoon				3				7	3			
Badger								1				
Striped Skunk								2	1			
Mink									1			
Weasel/Skunk								5				
Carnivore								1	1			
Deer/Pronghorn	5	13	147	52	4	13	21	279	60	16	46	149
Deer	2	11	76	31	2	4	14	239	20		15	44
Pronghorn	1		1	4	1		1		1			1
Indet. Mammal, sm	2		12	6	2	1	4	64	4			2
Indet. Mammal, med		1	29	5	2		5	56	6	2	7	9
Indet. Mammal, Lg			7	3		1		15	2		2	
NISP*	175	115	1084	555	65	89	195	1750	279	234	2015	322
# of Taxa	14	9	26	25	13	12	23	43	29	13	31	14

* Number of identified specimens

For example, there are two to four different genera of turtles represented in some proveniences in Stratum B, one terrestrial and up to three aquatic types. In levels B2 and B5, the individual turtle remains were plotted, and it was found that indeterminate turtle shell fragments clustered in the same quadrants as the identified genera instead of merely being scattered across the occupation surface. Converging lines of evidence make it unlikely that these clusters represent post-depositional natural turtle deaths: (1) both aquatic and terrestrial forms occur together; (2) they are associated with burned cultural features; and (3) the shell fragments exhibit differential burning, mixed with some that are not burned at all. Figures 8.26a,b show the clustering of turtles associated with hearths in the northeast and southwest corners of level B2 (a) and following the same pattern as the ash concentrations around the large hearth in level B5 (b). These plots also show locations of other non-mammals. The symbols represent small clusters or single elements of various taxa thought to be potential resource faunas, such as turkey (and large bird remains), duck, quail, and fishes such as catfish, centrarchids (bass/sunfish), and gar. They tend to follow the clustering of other game, especially deer and rabbit in B2 (Figure 8.25), and around the hearth in B5. Clearly, deer is the meat source of choice. While turtle and rabbit may exceed in estimated individuals present (e.g., nine rabbits in level B2), more usable meat and byproducts are represented by the deer remains.

In level B6, excavators found a concentration of deer bones in the center of the block (Figure 8.27). Analysis shows two adult individuals based on two upper left second premolars as well as two right distal ulnae. Dental ages on these individuals are 5 years and greater than 7 years at death. A total of 196 elements were recorded for these two deer. No phalanges were recovered at all, an anomaly not explained by preservation alone because phalanges usually preserve very well.

The absence of phalanges and the under-representation of metapodials in level B6 suggest that the carcasses were skinned with the lower legs retained, thus creating a container in which the filleted meat could be carried. No lithic tools or debitage were recovered, further suggesting rapid dispatch with ready-made tools. Other faunal material found in B6 consist of a cottontail skull and the hind half of a jackrabbit associated with the deer bones; vertebrae and ribs coded as medium-size mammal, which cluster with the jackrabbit; bones of an indeterminate medium-size bird and an indeterminate large bird also occur in this cluster. Lastly, remains of a box turtle were found with a pronghorn scapula in the northeast corner of the block, and a snake rib and vertebra were found on either side of the deer cluster separated from each other by 4 m. The faunal evidence in this level points to a multi-species kill/butchering locality, rather than a habitation.

Taphonomy

Taphonomically, the elements in B6 were affected mostly by calcium carbonate deposits. Those that are free of the deposits appear to have been either rodent gnawed or etched and stained, possibly by root action from the paleosurface in level B5; otherwise, the bones show no signs of excessive surface weathering or severe deterioration, indications that the carcasses were buried soon after the flesh decomposed. No evidence of a hearth was found in this level. Eighteen of the deer elements, however, exhibit cut marks, covering the entire range of butchering activities.

Taphonomic evidence for the other living floors of Block 2 is displayed in Figures 8.29-8.30. In comparison with Block 1 (Figure 8.21a), the same general trends are noted in Block 2 in which the majority of deer elements are etched/stained, and except for the levels at the juncture of the two stratigraphic units (A5 and B1), gnawed elements constitute less than 20% of the deer bone in each level. While Figure 8.30b appears complicated, these data helped clarify the differences between B2 and B5. For instance, B2 yielded over twice as much total bone as B5 (Figure 8.29) and 5.5 times as much burned bone; however, on a percentage basis, B5 had almost 3 times more identified bone than B2 and more than 4 times the incidence of deterioration (post-cranial deer elements) (Table 8.17). These data indicate that this marked deterioration of deer elements in B5 is attributable to the concomitant reduction in the relative amount of burned bone in that level; that is, level B5 had relatively more unburned bone available for deterioration than did level B2. Therefore, in this case, the intensive taphonomic alteration seen on deer bone is largely cultural, and not exclusively geological in origin.

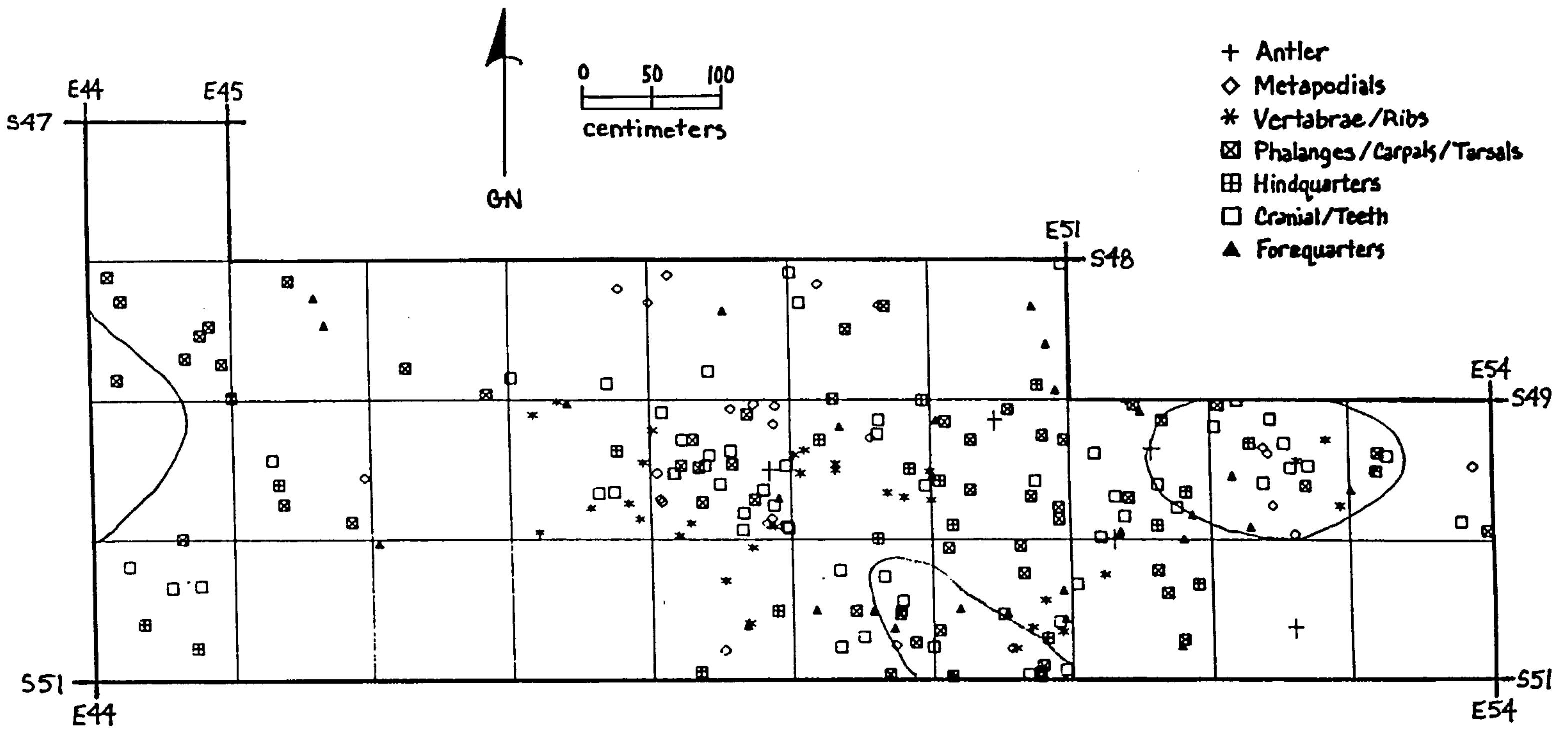


Figure 8.24 Spatial distribution of deer elements in 41CO150, Stratum A2.

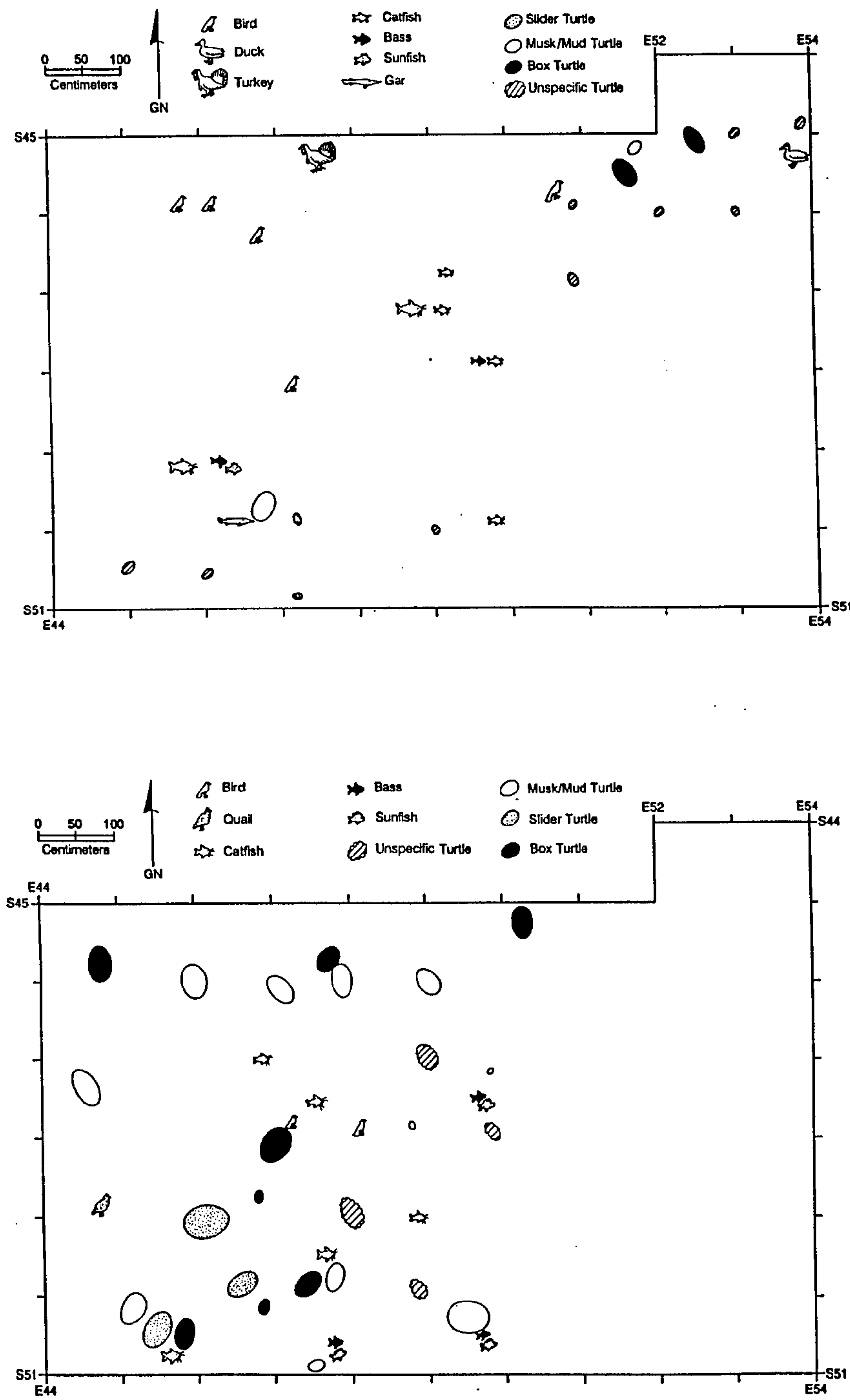


Figure 8.25 Spatial distribution of non-mammals in 41CO150, Stratum B5.

Table 8.16 Identified Fauna, 41CO150 Block 2 Features

Strat.Lv.Fea.	Contents (# of elements per taxa)
A.1.1	1 drum, 2 indet turtle, 1 d/p (all unburned)
A.1.2	9 box turtle, 21 indet turtle (1B), 1 cotton rat, 2 deer
A.2.4	2 frog, 6 musk/mud turtle (2B), 6 box turtle (1B), 37 indet turtle (5B), 30 cottontail (1B), 1 jackrabbit, 2 indet rabbit, 19 cotton rat, 1 vole, 2 indet rodent (1B), 12 deer (2B), 1 pronghorn, 18 d/p (3B), 6 sm mammal, 3 med mammal
A.2.10	8 musk turtle (2B), 14 musk/mud turtle, 7 box turtle (1B), 44 indet turtle (4B), 12 cottontail, 8 deer, 15 d/p
A.3.9	5 slider (1B), 21 musk/mud turtle, 44 box turtle, 88 indet turtle (5B), 3 lg bird (1B), 1 cottontail, 2 gopher, 2 deer, 3 d/p, 2 sm mammal, 1 med mammal
A.4.6	1 sm fish, 1 indet turtle, 1 sm mammal
A.5.7	4 musk turtle (3B), 1 musk/mud turtle, 2 indet turtle
B.2.1	8 cottontail (6B), 1 indet rabbit (B), 1 sm mammal, 5 d/p
B.2.2	1 indet turtle, 3 turkey, 8 lg bird, 6 cottontail (1B), 1 canid, 1 raccoon, 3 deer, 9 d/p, 2 sm mammal, 1 med mammal, 2 lg mammal
B.2.3	1 box turtle, 9 indet turtle (1B)
B.2.4	9 box turtle (5B), 58 indet turtle (57B), 12 cottontail (4B), 1 jackrabbit, 1 badger, 6 deer (1B), 17 d/p (4B), 3 med mammal
B.2.5	25 cottontail (15B)
B.2.6	1 slider (B), 1 indet turtle (B), 5 cottontail (2B), 1 beaver (B), 1 med mammal (B)
B.2.7	1 indet rodent
B.2.8	8 indet fish (2B), 14 catfish (all B), 1 bass/sunfish, 1 sm bird, 33 cottontail (25B), 1 indet rabbit, 3 gopher, 2 woodrat (1B), 1 cotton rat (B), 4 indet rodent (3B), 1 mustelid (B), 9 sm mammal (7B), 1 med mammal (B)
B.2.9	1 catfish (B), 11 box turtle (5B), 34 indet turtle (22B), 2 lg bird, 1 med bird, 1 sm bird (B), 7 cottontail (4B), 5 deer, 17 d/p (8B), 1 sm mammal, 4 med mammal, 1 lg mammal
B.2.11	1 jackrabbit, 2 skunk (2B), 1 sm mammal, 1 med mammal
B.2.13	1 catfish (B), 1 indet snake
B.2.14	2 sm fish, 1 box turtle (B), 7 indet turtle (4B), 1 indet snake, 3 lg bird (2B), 16 cottontail (1B), 1 pocket mouse, 1 indet rodent, 7 d/p (6B), 4 sm mammal, 1 med mammal

Table 8.16, cont.

B.2.15	1 gar (B), 1 catfish (B), 1 musk/mud turtle (B), 3 indet turtle (all B), 1 cottontail (B), 1 gopher, 2 indet rodent, 1 deer (B), 3 d/p (all B)
B.2.16	25 cottontail (20B), 6 med mammal (all B), 1 indet carnivore, 1 woodrat (B), 1 sm fish (B),
B.3.1	3 cottontail (2B), 10 deer (1B), 30 d/p (11B), 2 sm mammal, 1 med mammal (B), 1 lg mammal (B)
B.3.2	1 sm fish, 3 musk/mud turtle (1B), 4 indet turtle, 1 indet snake, 3 cottontail (2B), 1 squirrel, 1 indet rodent, 2 d/p (1B), 1 med mammal (B)
B.3.3	1 deer, 1 d/p (B)
B.3.4	1 cottontail
B.3.5	1 sm mammal
B.3.6	2 gopher, 1 vole
B.3.7	3 sm fish, 1 indet lizard, 11 cottontail (7B), 1 vole, 1 indet rodent, 1 sm mammal (B)
B.3.9	1 box turtle, 1 cottontail
B.4.2	1 indet snake
B.4.4	2 indet turtle (B), 1 cottontail
B.5.4	1 cottontail
B.5.6	4 sm fish (1B), 2 bass/sunfish, 66 musk/mud turtle (5B), 237 indet turtle (46B), 2 indet snake (1B), 1 canid (B)
B.6.1	1 indet turtle (B), 1 lg bird, 2 med mammal (1B), 10 deer, 49 d/p (1B)

Key: Strat = stratum; Lv = level; Fea = feature; B = burned; d/p = deer/pronghorn category; indet = indeterminate; non-ven = non-venomous snake; sm, med, lg = small, medium, large (size categories)

Table 8.17 Comparison of Levels B2 and B5 in Block 2, 41CO150*

	# ID (%)	# Burned (%)	Deer Taphonomy
B2	1,750 (8%)	7,712 (36%)	(9% Deteriorated) (37% Burned)
B5	2,015 (23%)	1,404 (16%)	(38% Deteriorated) (5% Burned)

*Total bone from B2 = 21,663; B5 = 8,783.

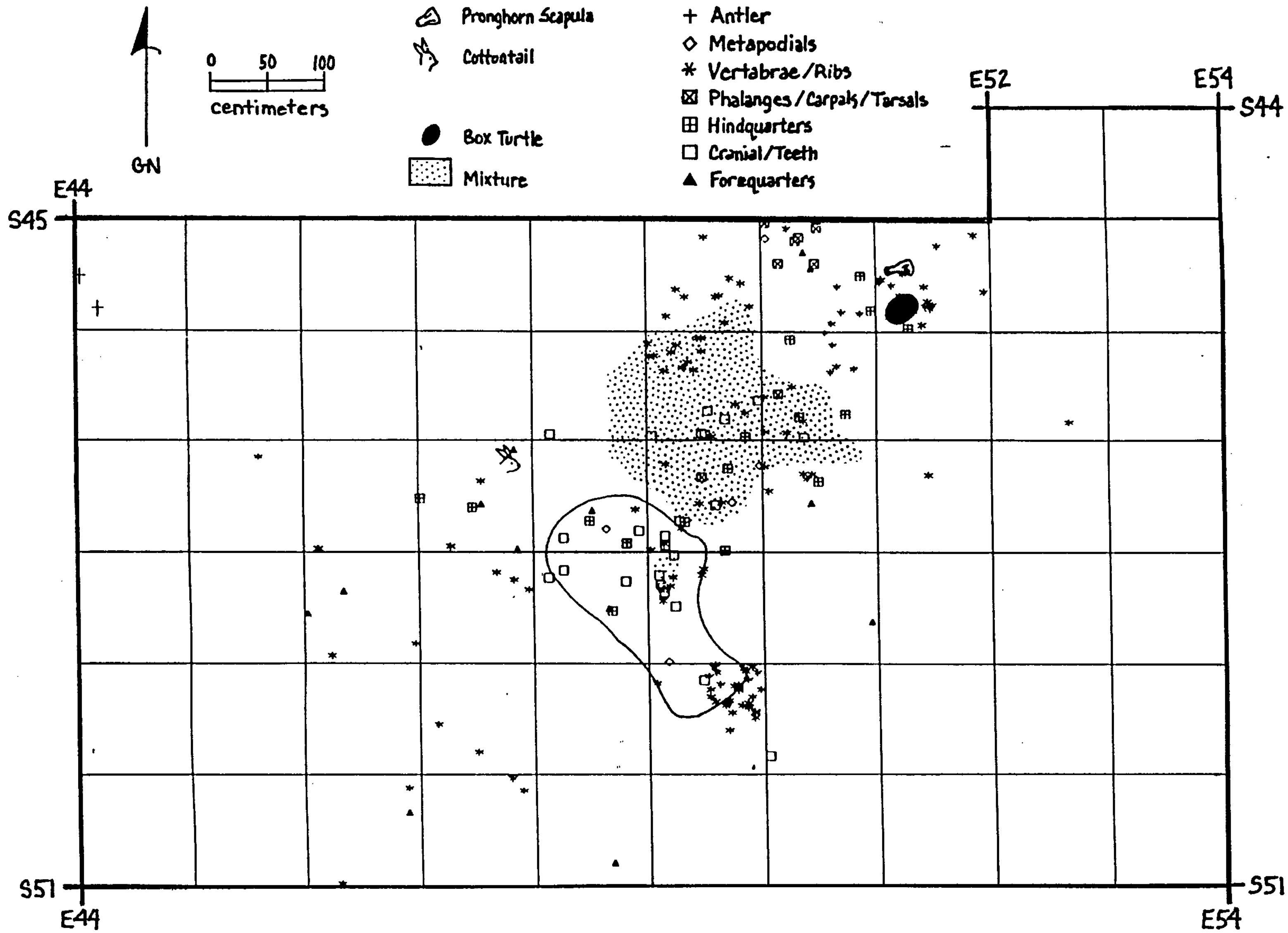
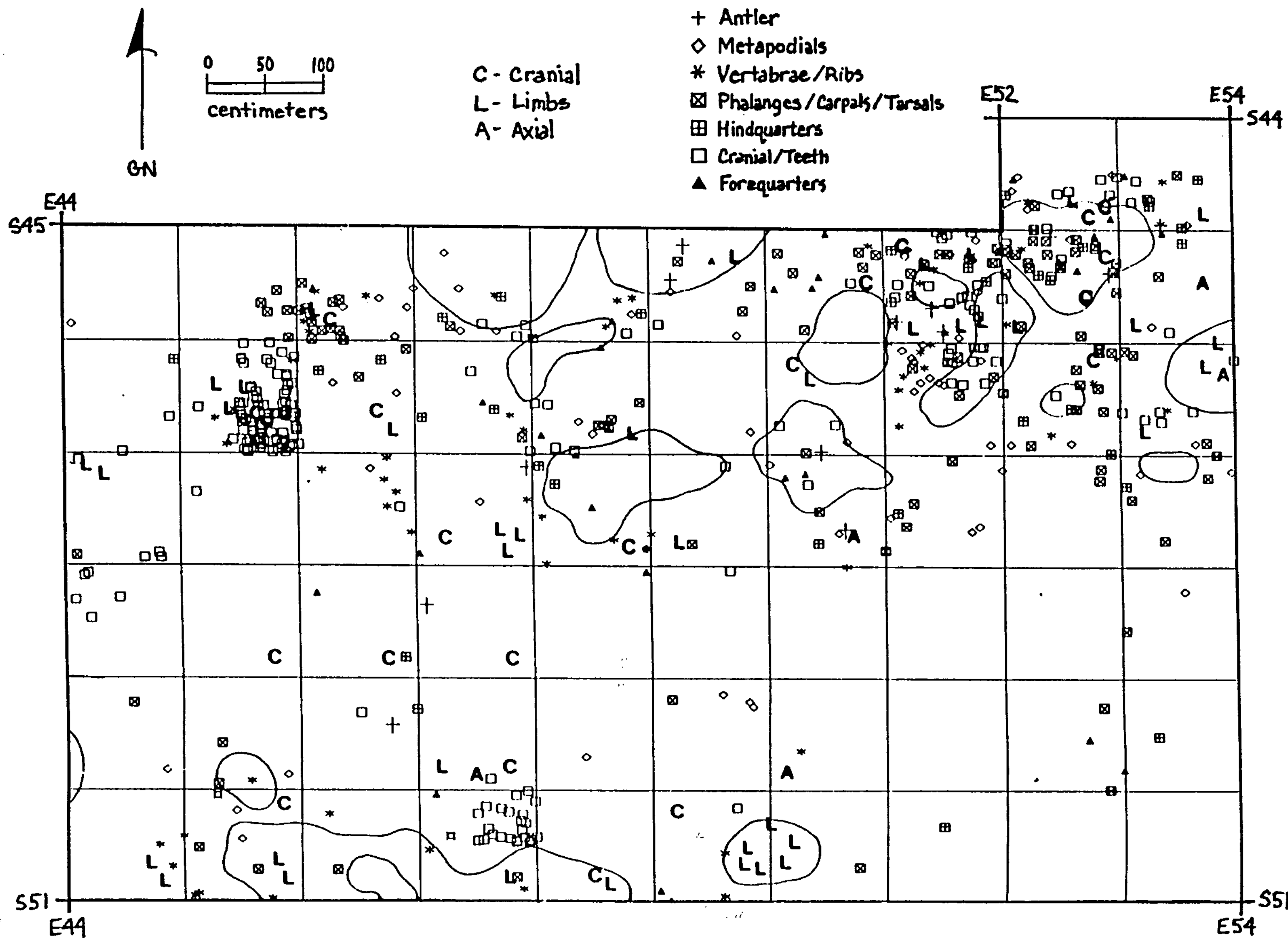


Figure 8.26 Spatial distribution of deer and rabbit in 41CO150, Stratum B2.

Figure 8.27 Spatial distribution of deer elements in 41CO150, Stratum B6.



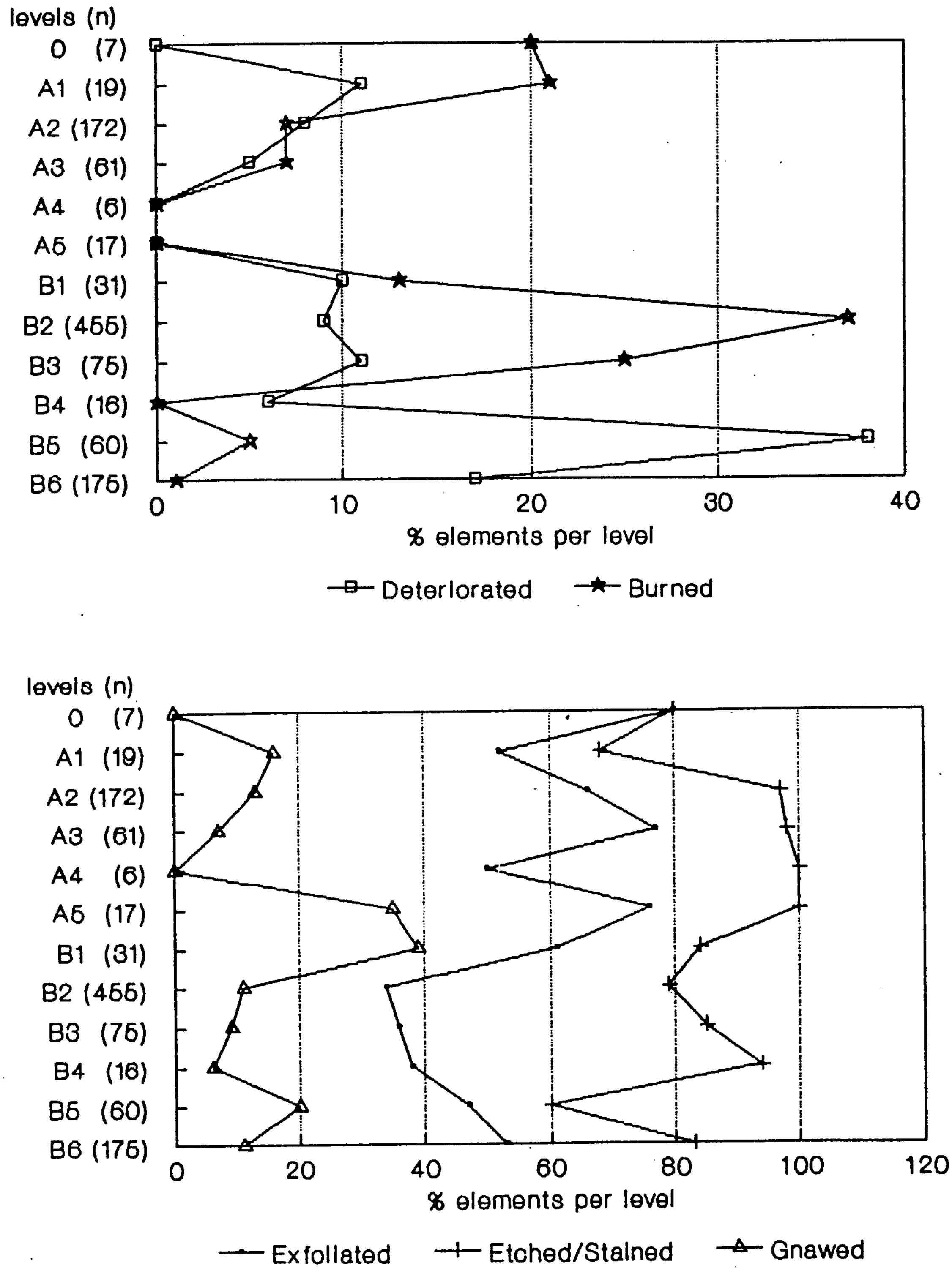
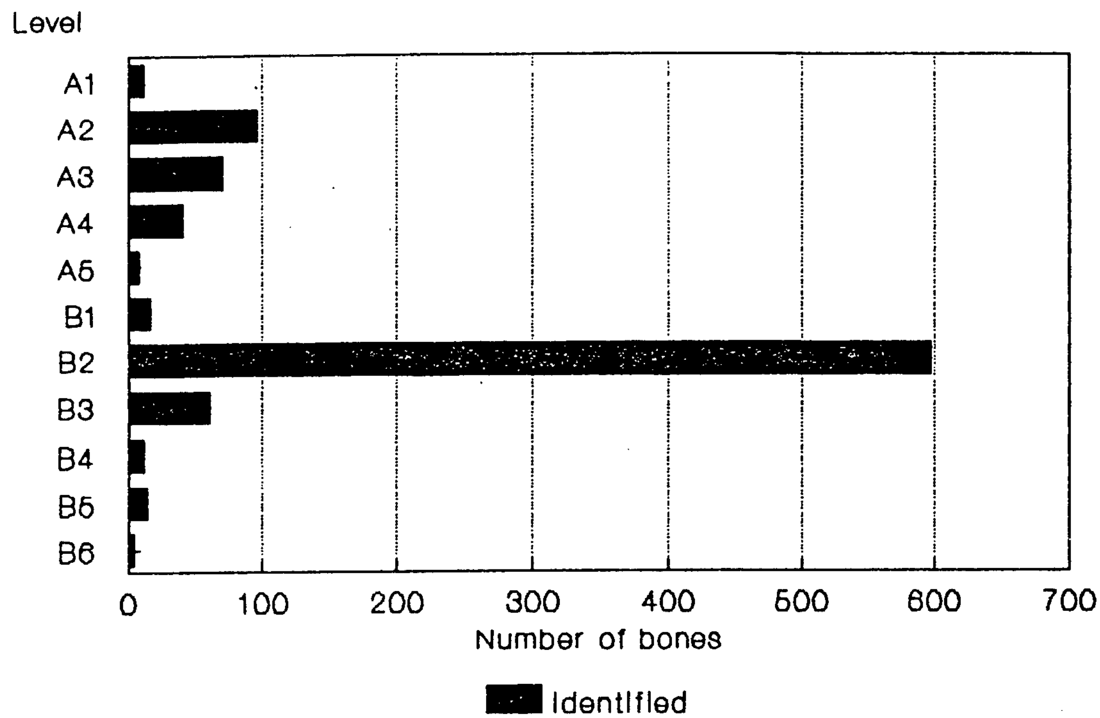


Figure 8.28 Taphonomy of post-cranial deer elements, 41CO150, Block 2.



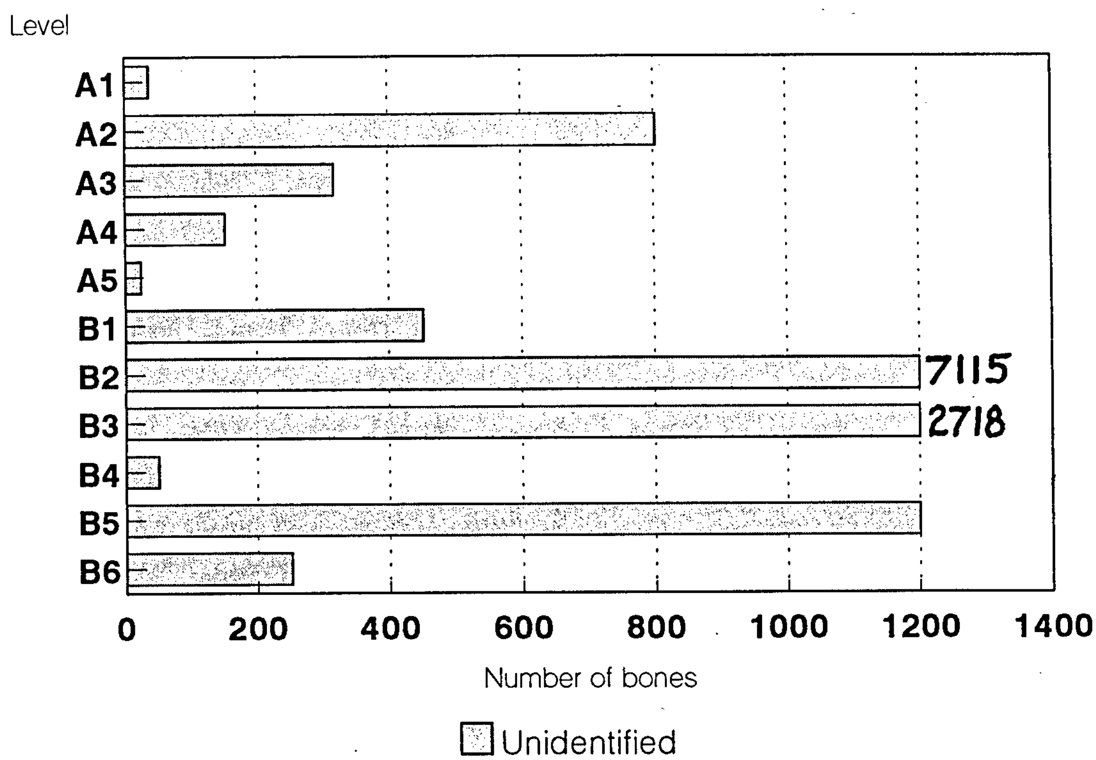


Figure 8.29 Distribution of identified and unidentified burned bone, 41CO150, Block 2.

Faunal Summary

Deer, rabbits, and turtles dominate the bone assemblages from the discrete occupations at 41CO150 and represent exploitation of an "edge" habitat so abundant in the riparian ecosystem in which the site is located. From Stratum B, pronghorn, ground squirrel, and raccoon merit comment as denizens of the other communities available for exploitation during the various occupations of this part of the site. Pronghorn and ground squirrel are grassland dwellers, while mink and raccoon are woodland creatures. Added to the presence of aquatic forms (fishes, amphibians, turtles, and beaver), it can be seen that the location of this site was suitable for the procurement of a variety of animal foods. Bird remains that were identifiable in the Stratum B units of the site include representatives of the three major biomes: grassland (quail and prairie chicken), woodland (turkey), and aquatic (duck). But in Stratum A, birds were not identifiable beyond size categorization.

As a final note, the count for spiny lizard in Stratum A is inflated, representing mostly scales, a mandible, and some vertebrae found on the surface or from wall cleaning from what appears to be a recent, non-archaeological intrusive. Another scale was recovered from A3, but from the same unit as the others and is considered a contaminant. In B5, however, two spiny lizard scales were found in Feature 3, and a horned lizard dermal ossicle was found in another part of that living floor. These appear to be associated with the archaeology of that surface, but the extent of lizard contribution to the diets of foragers of temperate parkland is not known. At present, there is no reason to doubt the inclusion of lizards or rodents in their subsistence regime. Coprolite evidence indicates that these two small taxa are part of the diet of hunter/gatherers of the Lower Pecos region of Texas (Lord 1984; Sobolik 1991).

SUMMARY

The Gemma Site has a detailed record of repeated occupations by Late Archaic groups. The several occupation surfaces register a complex of activities, within and between the discrete surfaces. The number of features is very high for surfaces that appear to have been occupied briefly. This suggests quite intensive activities, and/or rather prolonged occupation episodes. The high density of faunal remains supports the latter view. Low artifact densities in this case are suggested as evidence only that tool manufacture and tool discard rates were low. Curation of tools may well explain their low numbers in the assemblages. Further, spatial aggregation of tools, seen in several levels indicates that sampling error could be very high for any given occupation surface.

The position of this site within an abandoned channel is essential to the type of geoarchaeological record here. This setting led to excellent superpositioning of occupation surfaces. The spatial patterning is excellent, and assemblages of artifacts and faunas show little evidence of post-occupational modification related to surface agents. The latter include humans that may have scavenged or disturbed occupation debris, as well as natural agents of disturbance or modification. While this geologic context was not documented in the local literature, it is repeated at site CO144 and downstream at DN217. Because of deep burial, these settings may have gone undetected, but the record from Ray Roberts shows that they are potentially significant places to study. An excellent example of this site formation setting is the Coffee site in Kansas, where stratified Archaic occupations were very well preserved in a cut off channel (Schmits, 1978).

It is challenging to consider the tempo of occupations here. The occupation surfaces are separated by near-sterile alluvium; thus while the occupation episodes took place during dry periods, overall flood activity was high over the course of site occupation. While winter occupations were initially suspected, the frequency of mussels and aquatic resources argue for warmer season use for at least some of the major horizons, or perhaps of parts of each horizon. Seasonality indicators are otherwise inconclusive, yet differences in emphasis are noted. Stratum B5 for example shows less use of deer than others. Stratum B2 has a high number of small game and bird taxa. These differences may relate to seasonality, group size or perhaps the duration of occupation episodes. The overarching pattern here is one of local resource exploitation from habitats surrounding the site by an apparently mobile population. The apparent mobility may be deceptive however, since this site registers that single loci were used quite frequently. This suggests that overall, resource availabilities were quite good, but that they were used by populations with a logistical rather than residential pattern of settlement and resource procurement.

There is some indication of slightly drier climates from the higher occupation horizons. Changes in the ratios of cottontail to jackrabbit, and a few antelope are noted. However slight, these are matched by increases in regional cherts in the assemblages. This is interpreted as indicating that these populations may have foraged farther to the west, or north to the Red River Valley, on a seasonal or periodic basis, or perhaps came into more frequent contact with groups from those areas. It is not possible to demonstrate any significant change in the periodicity of site use however.

CHAPTER 9
THE JAYRN SITE (41CO144)

INTRODUCTION

The Jayrn Site was located during UNT's survey in 1986. This site was previously unrecorded, yet appeared to contain a significant archaeological record of Archaic occupations. Testing confirmed this potential, and mitigation was recommended. Because of substantial depth of deposits as well as very clayey matrix, large block excavations were not possible. Two small blocks (superposed) treated the main site stratigraphy, and a third small block tested a feature discovered in a backhoe trench. All together, these investigations documented the presence of a significant series of stratified Late Archaic occupations, in a geologic context similar to that of the Gemma Site.

Testing

Initial testing, done in 1986 during survey, consisted of a single shovel test, which yielded negative results. Additional testing conducted in 1987 included four backhoe trenches that were oriented east-west, perpendicular to the river channel (Figure 9.1). Several buried cultural horizons were detected in the trenches. Based on results of backhoe trenching, a proton magnetometer survey was conducted which encompassed four 20x20 m grids. One 20x20 m grid was slightly north and west of the other three grids. Three grids were contiguous and encompassed a 20x60 m area. The magnetometer survey indicated the presence of a large subsurface anomaly within the most northerly 20x20 m grid. Subsequent investigations focused on this area of the site.

SITE SETTING AND GEOLOGY

Geomorphology

The Jayrn Site is located on the Elm Fork Trinity floodplain, a few hundred meters north of the Bobby D site (Figure III.2). The topography of the site area reveals a natural levee along the east bank of the Elm Fork Trinity (Figure 9.1). The levee deposits are silty, compared to the buried soil A-horizon parent material below (Figures 9.2-9.4; Tables 9.1-9.2). The levee deposits thin away from the channel. The low relief to the east-southeast of the area of excavations also suggests a splay (a lobe of coarser deposits lain down beyond a breach in the natural levee), expressed as a thin veneer of recent alluvium that covers the Holocene soil. Farther east on the floodplain, Trench J (Figure 9.5; Table 9.3) revealed apparent Late Holocene floodplain clays overlying alluvium that is probably the early Holocene Sanger Alluvium (Ferring 1993).

Stratigraphy-Soils

In the site area, two main stratigraphic units are evident: the Late Holocene alluvium (Pilot Point Alluvium) and recent levee/splay deposits that bury the former. These units were exposed in Trench 1 (Figure 9.2), Trench C (Figure 9.3) and in the Block 1-2 excavations (Figure 9.4). As shown in the profiles in Trench C and in the excavation blocks, the levee deposits are silty and calcareous (Figures 9.3, 9.4; Tables 9.1, 9.2). The Holocene alluvium is up to 6m thick, as shown in Trench C. These deposits overly a truncated soil in Trench C that may be a mid-Holocene soil, or perhaps an older one. The Holocene alluvium is channel fill, indicated by the fining upward texture as well as primary structures in the lower section. These deposits are similar in Trench C and in the excavation area. As at CO150, it appears that the channel was filled rapidly in the Late Holocene, but that the rate of filling waned through time. Organic matter has accumulated in the upper part of the sections as a result of slower deposition and because of surface stability after deposition. Calcium carbonate content is low in the upper part of the buried soil, both as a result of leaching and as a consequence of high clay content (see discussion of 41CO141, Ferring (1987b)). Higher carbonate content in the lower parts of the late Holocene alluvium is related to texture (higher carbonate content in coarse silt and sand, derived

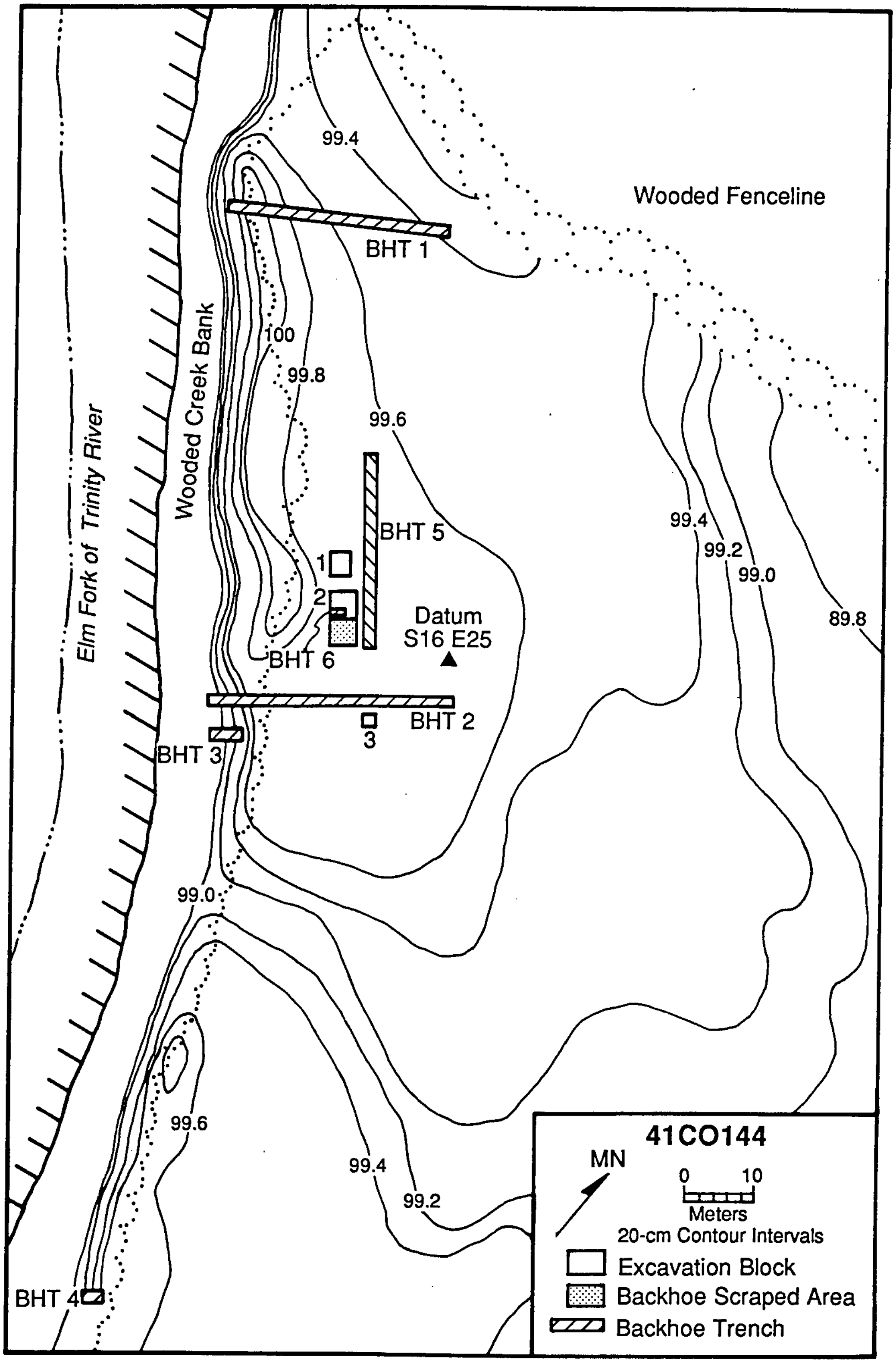


Figure 9.1 Map of CO144, showing excavations.

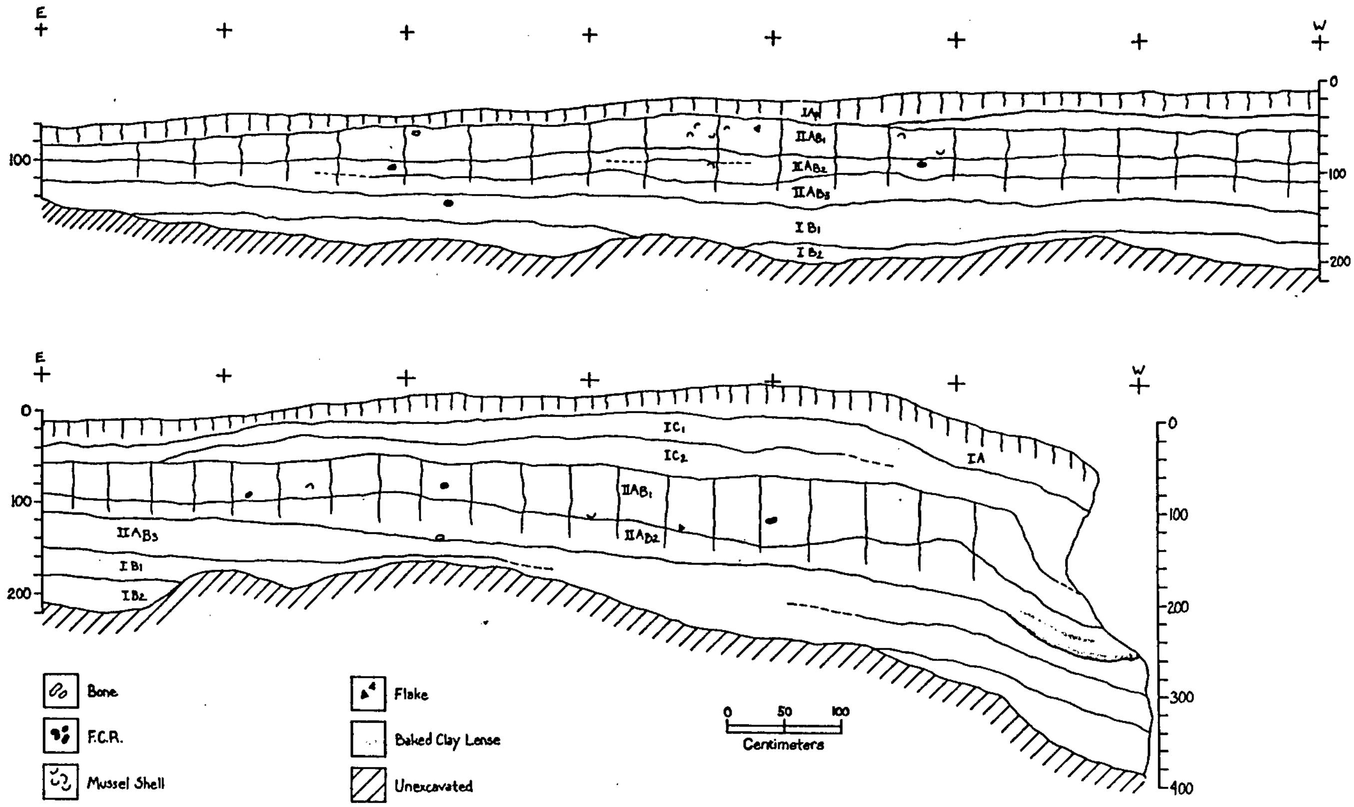


Figure 9.2 Cross section of CO144, Trench 1.

from bedrock fragments); leaching and/or redistribution of carbonate in the lower parts of the section is also indicated by filaments and, in Trench C, a few nodules at greater depth in the sandier horizons. The overall high carbonate content favored preservation of bone and shell.

In sum, the Late Holocene sediments at CO144 appear to have been deposited in cut-off channels, comparable in part to the situation at the Gemma Site. Here the lower parts of the fill resembles lateral accretion deposits- settings that would not be favorable for prehistoric occupations. However, down to depths of about 2.5 m, the texture of the fill becomes finer and more homogeneous vertically, suggesting that the active channel shifted away from the site area. This history is similar to that at the Bobby D Site in the area of the 1986 excavations (Ferring 1987b). Here at the Jayrn Site, however, prehistoric occupation horizons extend deeper into the channel fill.

Geochronology

Two radiocarbon ages were determined on charcoal samples from CO144. An age of 2284 +/- 90 yr BP (Beta-32986) was obtained on charcoal from the feature in Block 2, levels 2-3. An age of 500 +/- 60 yr BP was obtained on charcoal from the fill of Feature 5 in Block 3. The latter is intrusive into the upper part of the buried soil, and is thus a minimum age for the parent material of the soil. Ages from CO141 suggest that the soil parent material probably accumulated at a moderate rate (Ferring 1986a) until about 750-800 yr BP, although slow deposition continued after that time.

The age of about 2280 yr BP in Block 2 (2m below surface) is concordant with the archaeological data here and with the geology and radiocarbon ages from the nearby Bobby D Site. If an age of 800 yr BP is

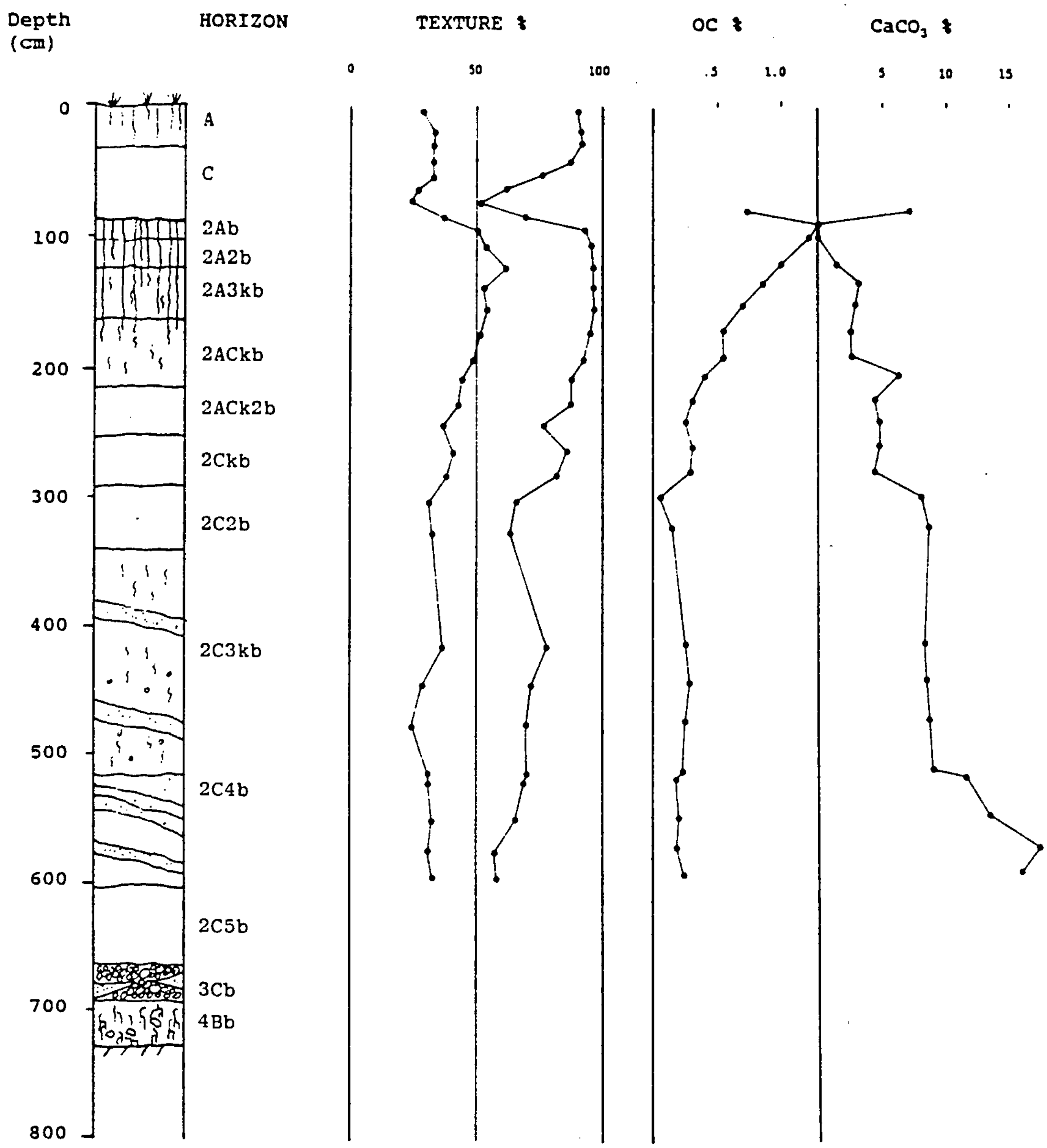


Figure 9.3 Soil Profile of CO144, Trench C.

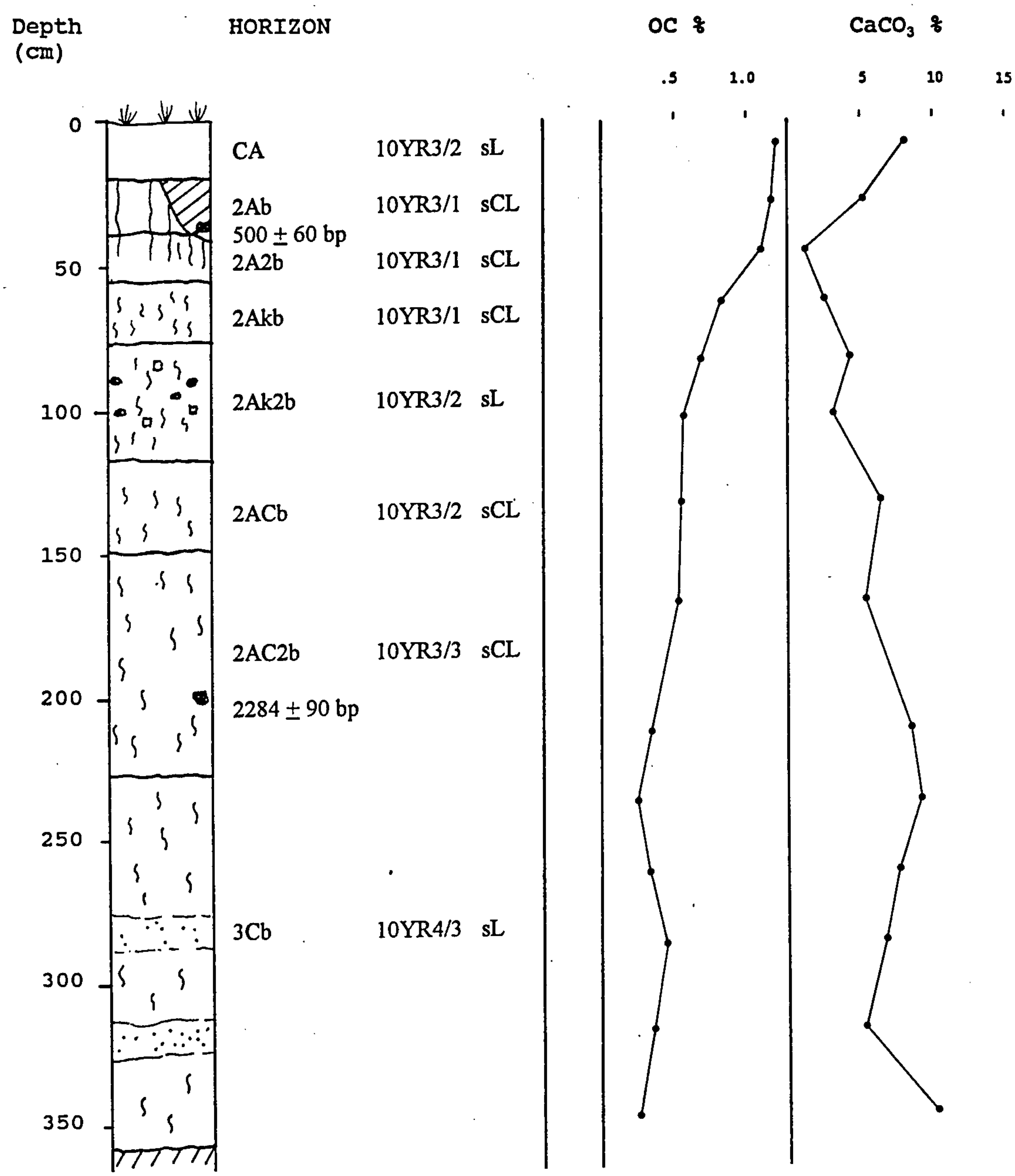


Figure 9.4 Soil Profile of CO144, Blocks 1-2.

Table 9.1 . Soil Profile Description
PROFILE CO144, TRENCH C

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY
A	0-38	10YR3/2	sL	mf sab	v rctn	aw
C	38-49	10YR4/2	sL	wm sab	v rctn	aw
C2	49-68	10YR4/2	sL	mm sab	f fi,ct	aw
C3	68-79	10YR4/3	L	w gr	v rctn	ab
C4	79-91	10YR3/2	sL	mf sab	v rctn	ab
2Ab	91-104	10YR2/1	sL	sf sab	f fi	as
2A2b	104-129	10YR2/1	sCL	sf sab	n rctn	cs
2A3kb	129-168	10YR3/1	sCL	sf sab	c fi	ds
2ACkb	168-220	10YR3/3	sCL	sf sab	c fi	gs
2AC2kb	220-259	10YR4/3	sCL	mm sab	f fi	ds
2Ckb	259-298	10YR4/3	sL	wm sab	c fi	gs
2C2b	298-346	10YR5/3	sL	wm sab	v rctn	ds
2C3kb	346-521	10YR4/3	sL	wm sab	m cc;f rz	gs
2C4b	521-610	10YR4/3	fSL	thin dipping beds		cs
2C5b	610-670	7.5YR4/5	SCL	ms	v rctn	ai
3C6b	670-700	gravel; moderate to poorly sorted; clasts with carbonate crusts; many snails, clams; canid skull				
4Bb	700-735+	10YR6/2	grCL	sm sab	m cc ; cfs 10YR4/6 mott	

Table 9.2 Soil Profile Description
PROFILE CO144, BLOCK 1-2

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY
(surface truncated)						
CA	0-38	10YR3/2	sL	mm/f sab	v rctn	cs
2Ab	20-38	10YR3/1	sCL	sf/m sab	v rctn	gs
2A2b	38-56	10YR3/1	sCL	sm sab/ag	w rctn	cs
2Akb	56-77	10YR3/1	sL	sf sab	m fi	gs
2A2kb	77-119	10YR3/2	sL	sm ag/sab	m fi	gs
2ACb	119-150	10YR3/2	sCL	mm sab	v rctn	ds
2AC2b	150-229	10YR3/3	sCL	mm sab	f fi	cs
3Cb	229-360+	10YR4/3	sL	medium beds; common charcoal, carbonate filaments.		

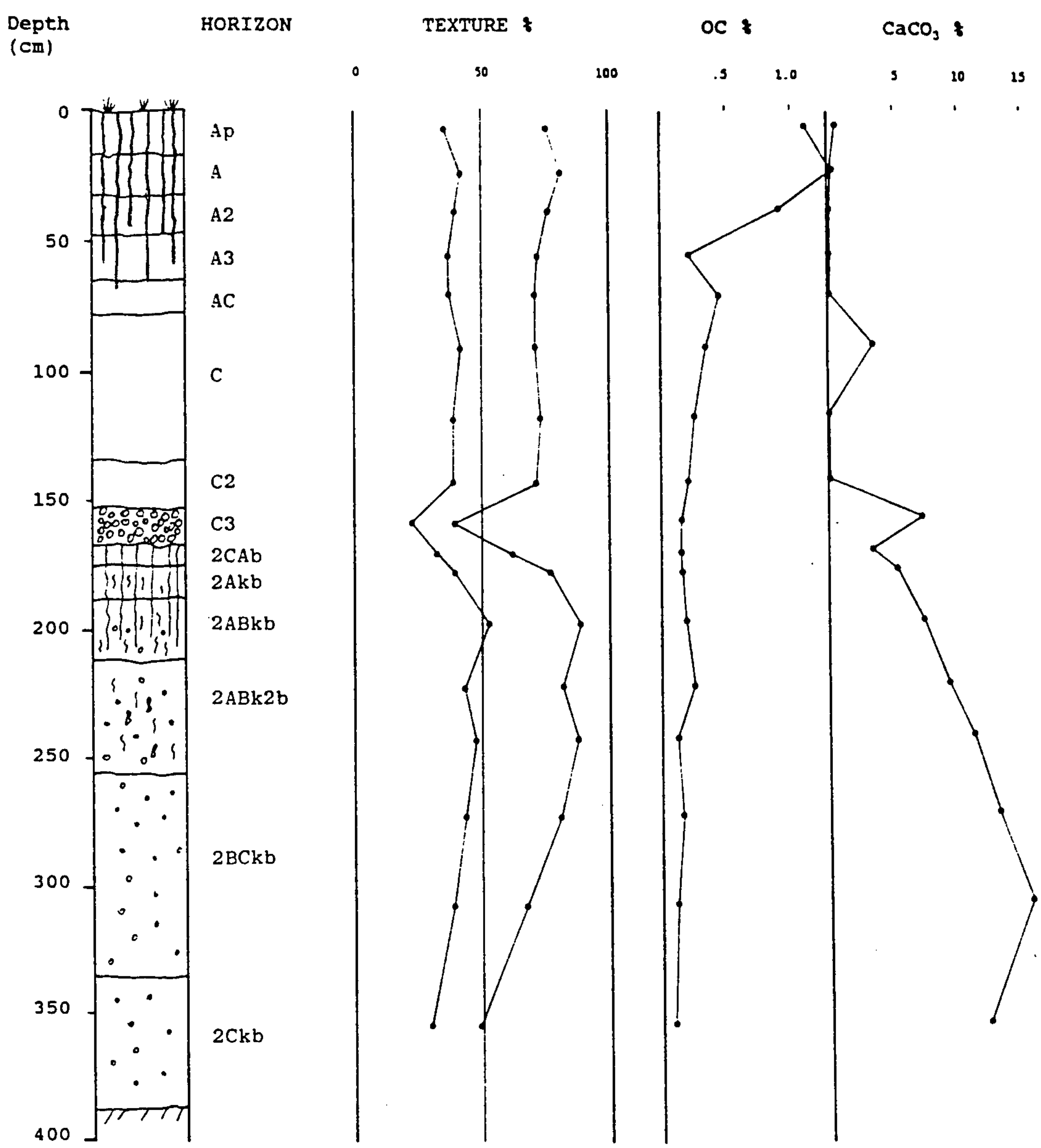


Figure 9.5 Soil Profile of CO144, Trench J.

Table 9.3. Soil Profile Description
PROFILE CO144, TRENCH J

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY
Ap	0-17	10YR3/1	CL	sm sab	n rctn	aw
A	17-32	10YR2/1	sC	sm sab	n rctn	cs
A2	32-48	10YR2/2	CL	sm sab	n rctn	gs
A3	48-65	10YR3/2	CL	mm sab	n rctn	gs
AC	65-78	10YR3/3	CL	mm ag	n rctn	gs
C	78-135	10YR4/3	CL	sm sab	n rctn	gs
C2	135-154	10YR5/4	CL	sm sab	n rctn	cs
C3	154-168	10YR5/6	grSCL	ms	v rctn	cs
2CAb	168-176	10YR5/6	CL	ms	v rctn	ci
2Ab	176-189	10YR4/2	CL	sm sab	v rctn	ci
2ABkb	189-213	10YR4/2	C	sm ag	m fi/f cc	cs
2ABk2b	213-258	10YR3/3	SC-C	sm ag	m fi,cc	gs
2BCkb	258-337	10YR4/4	SC-CL	mm ag	m cc	gs
2Ckb	337-377+	10YR4/6	SCL	ms	m cc	

assumed for the upper part of the buried soil, the net rate of deposition in the Block 1-2 area during the late Holocene would have been ca. 0.12 cm/yr, a moderate rate (Ferring 1986a). Sedimentary-pedogenic data suggest however, that the rate of deposition waned through time, and was more rapid during accumulation of the deeper, coarser sediments.

Archaeological Contexts

Archaeological materials at the Jayrn Site are contained in calcareous, organic-rich, fine-grained alluvium that comprises the upper part of Late Holocene channel fill. Low energy deposition is indicated, and the potential for physical transport of archaeological materials was low. This conclusion is supported also by the archaeological data including well-preserved features.

Rates of deposition probably waned toward the end of late Holocene sedimentation here, and pedogenesis became a more important factor in site formation. Some bioturbation and-or pedoturbation of the upper materials probably occurred, although the effects of this have not been qualified. No in situ materials were found in the levee-splay deposits, which appear to be of recent age based on soils development. As at the Bobby D Site (Ferring 1987b), the levee-splay sediments were probably deposited as the channel migrated to its present position. This indicates that pedogenesis altered the youngest archaeological-bearing deposits until they were buried quickly by the levee-splay sediments, enhancing site preservation (see Ferring 1992).

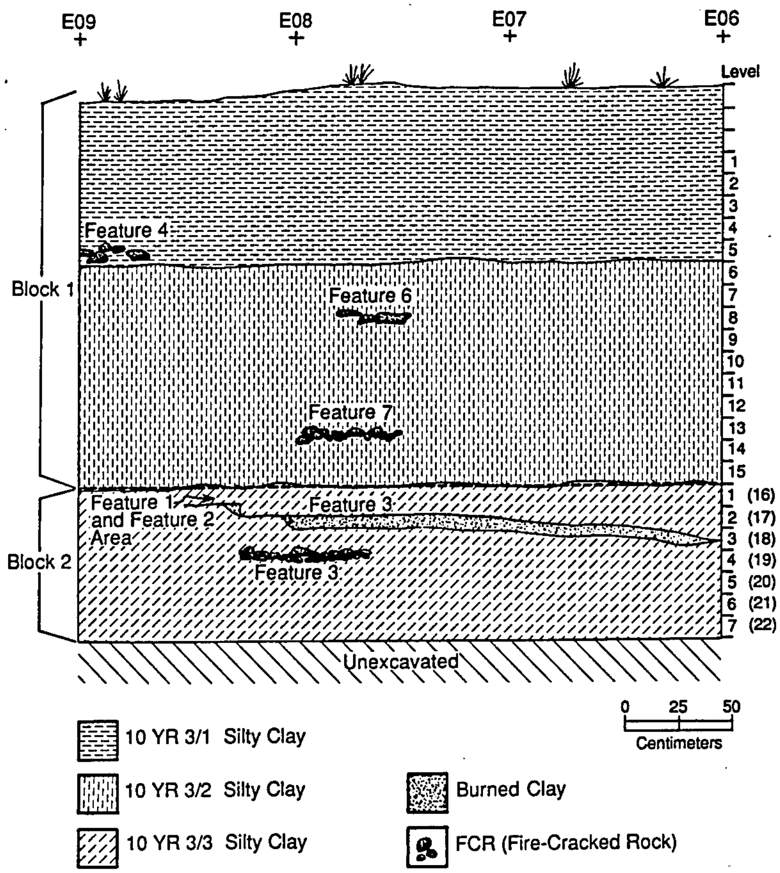


Figure 9.6 Profile of CO144, Blocks 1-2.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Strategy

Investigations in 1987 began with excavation of Trench 5 at the east edge of the subsurface magnetic anomaly (Figure 9.1). This revealed a dense concentration of buried cultural remains to a depth greater than 2 m. Three small excavation blocks were placed adjacent to Trenches 2 and 5 where cultural features and materials occurred in primary context. The overlying culturally sterile deposits within the area of Block 1, which measured 3x4 m, were removed with the backhoe. Excavation levels 2-6 were dug for the entire block. A 1x2 m test pit was located at the south end of Block 1 to test for deeper cultural material. The 1x2 m test pit consisted of units 10 and 11 (S4/E7-8). Units 10 and 11 were dug through levels 17 and 13, respectively.

Block 2, measuring 4x4 m, was placed 2 m south of Block 1. Approximately 2 m of overlying deposits were removed with a backhoe. Block 2 was established to recover a sample of the deeper cultural remains that had been exposed in the backhoe trench. Six levels, B1-B6, were excavated in Block 2. Levels 3 and 4, within the area of several features (see below), were divided into sub-levels A, B, and C. These sub-levels were based on stratigraphy within the features.

Block 3, measuring 2x2 m, was placed on the south edge of Trench 2 where a shallowly buried hearth had been exposed during initial testing. The block was established to ascertain the nature of the feature.

Features

Seven features were found during excavations at the Jayrn Site. Features in Block 1 were superposed in levels 6, 8, and 13 (Figure 9.6). Feature 4, a hearth, marked by a cluster of five large pieces of burned rock, occurred in level 6 of Block 1, and is the youngest feature recorded. Feature 4 was approximately 60x30 cm in area and was 14 cm deep; but the feature extended into the east wall of Block 1, and was therefore not fully exposed. Associated with Feature 4 were burned bone, small flecks of charcoal, and burned earth. Just north of this feature was a concentration of mussel shell covering about 1 sq m.

Feature 6 originated in Level 8 and was a hearth marked by a concentration of burned clay with some burned rock. It was approximately 52x21 cm in area with a depth of 6 cm. The feature was not completely exposed, as it was at the edge of a square in the 1x2 m test unit. Associated with the feature were small flecks of charcoal, bone, and debitage.

Feature 7, a rock-lined hearth, originated in Level 13. The exposed portion of the hearth was approximately 60x60 cm in area, with a depth of ca. 7 cm. The feature extended into surrounding unexcavated squares. The feature matrix had considerable burned clay.

Features in Block 2 originated in levels B2 and B3, and owing to stratigraphic proximity, may all be temporally related. Features 1 and 2 originated in level 2 (97.90-97.80 cm bd) and are apparently related to the same occupation (Figures 9.6, 9.7). Feature 1 was a hearth, marked by a concentration of burned clay with associated flecks of charcoal. It was 1.2x1.4 m in area with a depth of less than 10 cm.

Feature 2, also a hearth concentration of burned clay with associated mottling of charcoal flecks, was similar to Feature 1. It was 95x125 cm in area with a depth of 10 cm.

Feature 3 was first recognized in level B3 and continued into level B4. It consisted of two discrete parts. The first was a large, basin-shaped concentration of burned clay and charcoal. The burned clay was first recognized at an elevation of 97.80 cm bd and continued down 20 cm (97.60 cm bd). The second, and lower part of Feature 3 was a tightly packed, circular concentration of burned rock 55x60 cm in area with a depth of 13 cm. The burned rock was first encountered at an elevation of 97.73 cm bd. This burned rock cluster is directly beneath the central axis of the burned clay and charcoal, suggesting the two parts of the feature are related. The burned rock appeared to be slightly deeper than the higher evidence of burning however. Nonetheless, Feature 3 may be associated with the intense burning of Features 1 and 2. There is a continuation of burned clay throughout the levels.

Features 1, 2, and 3 are all in the same stratigraphic context as was a partially articulated Bison spp. vertebral column, several mussel shells, and a chert endscraper (Figure 9.7). A Godley point was recovered from level 6 of Block 2, below the features. Charcoal from levels 2-3 in Block 2 yielded the radiocarbon age of 2284 +/- 90 yr BP.

Feature 5, located in Block 3, was first encountered in the south wall of Backhoe Trench 2. The feature consisted of an amorphous concentration of burned clay, ash, and charcoal. It was 1.3x1.3 m in area with a depth of 22 cm. Its elevation relative to site datum was 99.28-99.06 cm bd., and was stratigraphically above the occupation horizons in Block 1. Associated with it were rare pieces of debitage, but common shell and abundant bone (bone densities appear very high because the feature matrix was all fine-screened). The function and cultural origin of Feature 5 are not certainly known. The very low artifact densities do not correspond to the abundance of bone and burned bone. A chert Gary point was found in level 6, below this feature; the point appears to be in good stratigraphic context. Likewise the radiocarbon age of 500 +/- 60 yr BP from Feature 5 appears reasonable, given that the feature is intrusive into the upper part of the site sediments. Although the radiocarbon age suggests a Late Prehistoric origin, there are not enough convincing attributes of the feature or its contents to independently ascertain its archaeological association with the rest of the materials at the site.

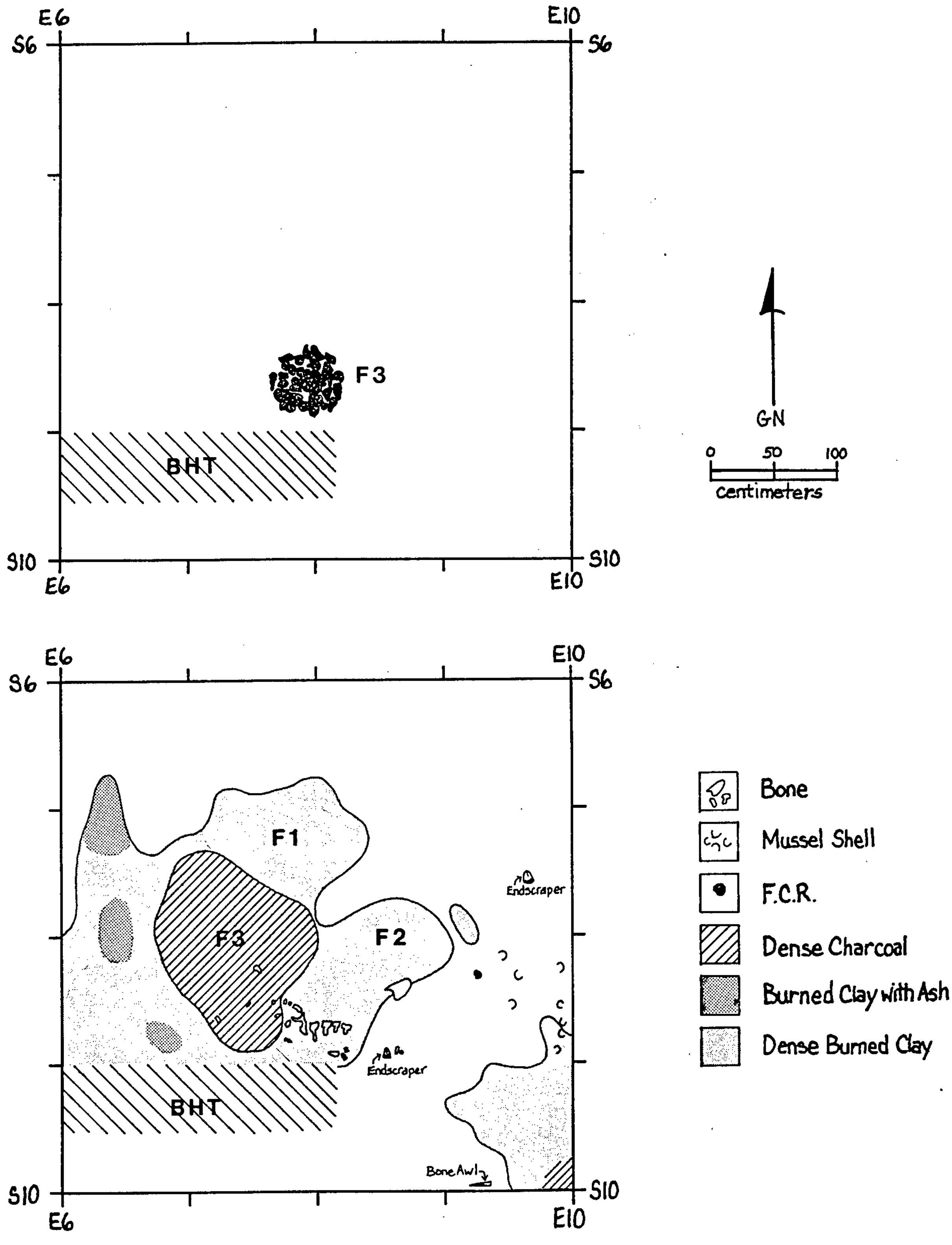


Figure 9.7 Plan of features, CO144, Block 2.

Artifact Assemblages

A sample of 941 artifacts was recovered from Blocks 1-2 (Table 9.4). This is a product of low artifact density (Table 9.5), rapid sedimentation and small excavation block size. The lower artifact densities in Block 2 (the deeper block) appear to clearly represent rapid deposition and burial. Higher artifact densities in the shallower part of the site (Block 1) reflect slower sedimentation and not necessarily higher occupation intensity. It is clear that another occupation zone was present in between the two main zones excavated. This was revealed only in the 1x2 m unit that was excavated below the floor of Block 1, and can be seen in levels A10-A11 (Table 9.5). This illustrates that the site was occupied repeatedly, and we only sampled the earlier and later occupations in the main excavation blocks.

The lithic assemblages from the site all are products of Late Archaic occupations (Tables 9.4, 9.6-9.8). No evidence of a Late Prehistoric component was recovered, other than the radiocarbon dated feature in Block 3, which lacked diagnostic Late Prehistoric artifacts. Raw material procurement is dominated by use of local quartzites, yet a third of the debitage from level B3 is regional chert, and the two large scrapers there are also made on regional chert blanks. This pattern is similar to that seen at the Gemma Site. Also paralleling that site are the marked fluctuations in raw material type in the upper levels, where better samples were recovered. Level A6 had less than 4% chert, while level A3 had about 40% regional chert (Table 9.6). Obviously, Late Archaic mobility and raw material procurement patterns were quite variable towards the end of that period.

Large debitage is quite common in these samples, despite the low numbers of blank-preforms and cores. This is matched by moderate amounts of cortical pieces. Especially in the later occupation horizons, these patterns suggest that final tool manufacture from both chert and quartzite blanks was carried out at the site, reiterating patterns registered in the upper levels of Block 2 at the Gemma site (Chapter 8). Here at the Jayrn site as well, all the cores and blank-preforms are made of Ogallala quartzite. The large chert debitage in Level A3 perhaps is the result of complete reduction of chert blanks, although the small block and small sample preclude conclusions here.

Table 9.4 ASSEMBLAGE COMPOSITION
41CO144, BLOCKS 1,2

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	N
A2	13						13
A3	191			2	2		195
A4	173						173
A5	113		1	1	1		116
A6	190				4	2	196
A7	120		1		1		122
A8	30						30
A9	108		1				109
A10	106		1				107
A11	356			1			357
A12	81						81
A13	4		1				5
A14	12	1					13
A15	3						3
B1	4						4
B2	36			3			39
B3	10						10
B4	14						14
B5	0						0
B6	1				1		2
TOTAL	925	1	5	7	9	2	941
PCT	98.30	0.11	0.53	0.74	0.96	0.21	

Table 9.5 ARTIFACT DENSITIES, CO144, BLOCKS 1-2

Block-level	base lev (m)	debden n/m3	artden n/m3	boneden n/m3	% burned
A2	99.2	6.36	6.36	29.09	46.15
3	99.1	129.09	131.82	78.18	51.96
4	99.0	107.27	107.27	100.91	56.04
5	98.9	50.91	53.64	106.36	46.83
6	98.8	140.91	145.45	226.36	40.49
7	98.7	160.00	180.00	1020.00	32.43
8	98.6	20.00	20.00	130.00	16.67
9	98.5	130.00	140.00	1060.00	42.50
10	98.4	320.00	330.00	790.00	47.22
11	98.3	230.00	240.00	950.00	32.69
12	98.2	0.00	0.00	2660.00	50.00
13	98.1	0.00	10.00	380.00	30.00
14	98.0	210.00	210.00	330.00	48.91
15	97.9	20.00	20.00	120.00	60.00
B1	97.8	2.14	2.14	5.00	57.14
2	97.7	19.29	20.71	50.00	26.53
3	97.6	7.14	7.14	18.57	34.67
4	97.5	3.57	3.57	14.29	47.06
5	97.4	0.00	0.00	20.00	100.00
6	97.3	10.00	20.00	70.00	
7	97.2	0.00	0.00	20.00	
Mean		74.60	78.48	389.47	45.65
Std Dev		91.81	94.62	615.43	16.90

The tool assemblage from Blocks 1-2 is small, but exhibits marked similarities to that from the Gemma Site. Two typical endscrapers were found in the deep block in level B2. These are both made on thick regional chert flakes. The only other unifacial tools recovered are simple retouched pieces, all of which are made on Ogallala flake blanks. These were presumably made on-site, while the chert scrapers were probably imported as tools or blanks. A single quartzite chopper was found in level A5. Groundstone is limited to an Ogallala hammerstone and a metate fragment, both from level A6 in Block 1.

Table 9.6 DEBITAGE, DN144, BLOCKS 1-2

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
A2	5		1				1		7	14.29	0.00	28.57
3	33	7	23	21	20	5	20	13	142	40.85	32.39	54.23
4	43	3	44	19	6		3		118	7.63	18.64	55.93
5	20	3	25	3	2		2	1	56	8.93	12.50	55.36
6	37	2	78	33	1		3	1	155	3.23	23.23	74.19
7	6		7	1			2		16	12.50	6.25	62.50
8			2						2	0.00	0.00	100.00
9	10		2	1					13	0.00	7.69	23.08
10	16	3	7	5			1		32	3.13	25.00	40.63
11		4	10	9					23	0.00	56.52	82.61
12									0			
13									0			
14	4		11	3			2	1	21	14.29	19.05	80.95
15		1	1						2	0.00	50.00	50.00
B1			2	1					3	0.00	33.33	100.00
2	11		4	3	8	1			27	33.33	14.81	25.93
3	7		3						10	0.00	0.00	30.00
4	1		1		3				5	60.00	0.00	20.00
5									0			
6			1						1	0.00	0.00	100.00
7									0			

The projectile points from Blocks 1-2 are typologically diverse, and compare well to the range of styles at the Gemma Site (Figure 9.8; Table 9.8). The only point from the lower levels is Godley-like. Those from higher levels include Godley and Gary forms, and one large knife/point made on local black ferruginous sandstone; it has a thick cross-section, is bilaterally resharpened and has heavy basal grinding (Figure 9.8, A5,a).

Only 44 pieces of debitage, all but one quartzite, were recovered from the entire Block 3 excavation, despite the fact that most matrix was fine screened. The single tool from that excavation is a chert Gary point from level 6, apparently below the feature (Figure 9.8, 3a) and correlated stratigraphically with the upper part of Blocks 1-2.

ZOOARCHAEOLOGY

A total of 14,130 faunal remains were found in three excavation blocks from the Jayrn site (Table 9.9). Deeply excavated in one part, Block 1 produced 70% of the total bone recovered from the site; Block 2, stratigraphically below Block 1, yielded much less bone, but contained three features, one with articulated bison remains; and Block 3, a 2x2 m unit, yielded almost one-quarter of the total faunal remains, most of which came

Table 9.7 ARTIFACT TYPOLOGY- CO144

CLASS/Type	A3	A5	A6	A7	A9	A10	A11	A13	A14	B2	B6	C6
					L	E	V	E	L			
BIFACES												
Dart point	-/2*	1/-	1/3	-/1							1/-	1/-
UNIFACES												
End scraper									2/-			
Retouch, unilateral							-/1					
Retouch, bilateral									-/1			
Retouch, dist-lat	-/1	-/1										
Chopper		1										
BLANKS												
Blank-preform		-/1		-/1	-/1	-/1		-/1				
CORES												
Mult plat flake									-/1			
GROUND STONE												
Metate			1									
Hammerstone			-/1									
Total	4	3	6	2	1	1	1	1	1	3	1	1

* chert/quartzite

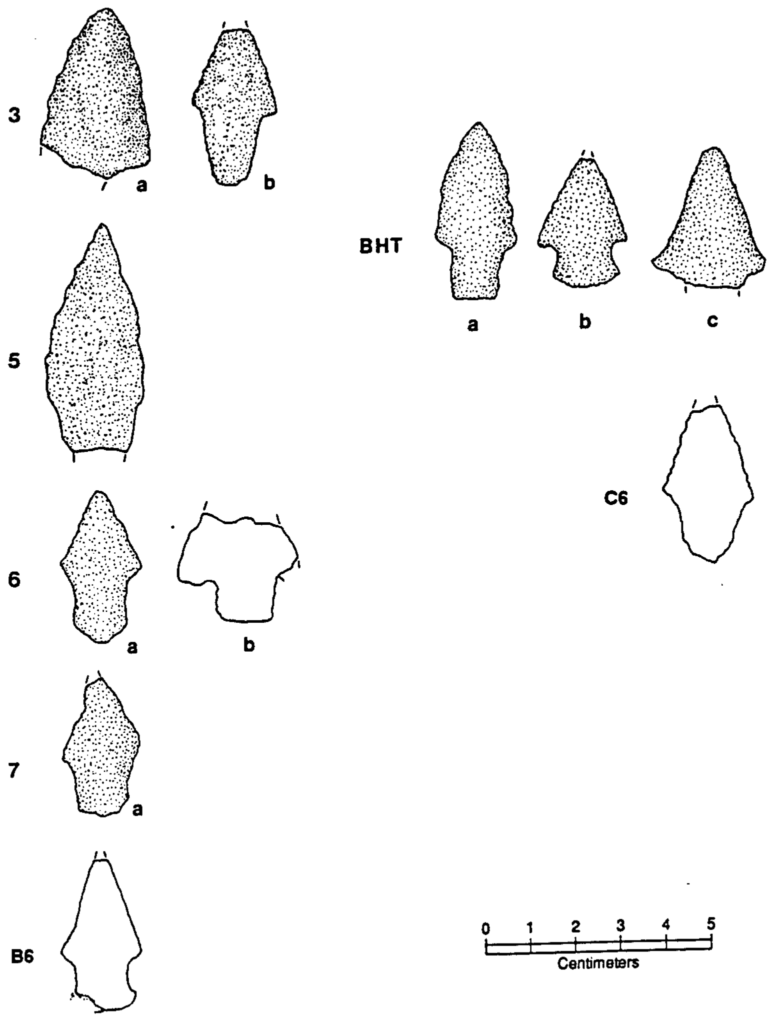


Figure 9.8 Projectile Points from 41CO144. See Figure 8.8 for symbols.

Table 9.8 PROJECTILE POINT TYPOLOGY- CO144
(X/x = chert/quartzite)

CLASS/Type	L E V E L						
	SURF	A3	A5	A6	A7	B6	C6
DART POINTS							
Dallas	-/1						
Gary	-/1	-/1					1/-
Godley				-/1	-/1	1/-	
Ellis	-/1						
Indeterminate		-/1	1/-	1/2			
Total	3	2	1	4	1	1	1

from the fill of the large feature; all of the fill from the feature was fine-screened. Even though the sizes of the blocks differed, densities of bone and artifacts followed similar trends throughout the levels in each block (see Table 9.5). The vertical distribution of faunal remains for Blocks 1 and 2 is presented in Figure 9.9. The apparent increase in levels 9-13 of Block 1 is the result of a concentration of bone in a 1x2 m unit that was fine-screened.

Table 9.9 Summary of faunal remains, 41CO144

	Total	Identified	Burned
Block 1	9,855	1,338 (14%)	2,719 (28%)
Block 2	841	144 (17%)	23 (7%)
Block 3	3,313	1,207 (36%)	2,216 (67%)
Surf/BHTs	121	121	

A comparison of the species lists (Tables 9.10, 9.11) also relates the effect of sample size in that the longest list comes from the block with the greatest number of bones. An assessment of which species occur only in one block (Table 9.12) reveals that Block 1 as a whole contained more aquatic species not found in the other blocks (e.g., turtles, salamander, beaver) as well as the singular occurrences of grassland species such as prairie chicken and pronghorn antelope. Block 2, with the fewest taxa, nevertheless had singular occurrences of gar, soft-shell turtle, and ground squirrel. Block 3 adds from fine screening the presence of shrew and harvest mouse (tiny mammals which are probably intrusive) and a mustelid.

The identified fraction from Block 1 comprised 40 taxa, of which 14 were recovered exclusively from the fine-screened unit (see Shaffer 1992). The taxa that were added by use of fine screening include indeterminate fish, catfish, salamander, a very small frog, viper, indeterminate snake (cf. garter snake), spiny lizard (scales only; probably intrusive), indeterminate lizard, prairie chicken, and five small rodent taxa. Of these, only the fishes and prairie chicken are the most likely faunas to be considered economically useful.

Block 2 was smaller (9 m^2) than Block 1 (12 m^2), but fewer levels were excavated, and the bone was in poorer condition. This component is stratigraphically below the components in Block 1, and soils analysis indicates coarser, more permeable sediments. These factors plus the age of the sediments, explain the deterioration of the osteological material originally left on the site's surface. The taxa that were recovered from Block 2 are for the most part those represented in Block 1. Notable exceptions are those mentioned above and bison.

Bison is tentatively identified from Block 2 (surface and Feature 2) and Block 3 (Feature 5). In Block 2, a bovid phalanx I was recovered, but depth of recovery is unrecorded, and its fragmentary condition rendered it nondiagnostic for bison. However, in Feature 2, axial remains of an immature individual were found in semi-articulated positions (Figure 9.7) in good cultural context; these fragmentary elements include unfused vertebral centra (lumbar), a section of the ilium, two fragments of the sacrum, and a rib blade. These fragments compare best with immature bison. Many more fragments were recovered, but because of their deteriorated condition, could only to be recorded as large-unidentified. None of these remains showed any signs of modification (cut marks or burning). Conversely, ten bovid tooth enamel fragments in Feature 5 of Block 3 were all burned to some degree. Lastly, and most intriguing, were a proximal femur fragment and a distal tibia that also compare well with bison. They were found in the backdirt of Backhoe Trench 5 (Figure 9.1). The epiphysis of the tibia is semi-fused, indicating an individual aged about 5 years at death (using aging data reported in Gilbert 1983:106).

Table 9.10 Identified Taxa, CO144, Blocks 1,2
(A= Block 1; B= Block 2)

	LEVEL																					
	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	B0	B1	B2	B3	B4	B5	B6	B7
Gar																	4	10				
Catfish		1																				
Indet. Fish			1	1		2	1				1			7							2	
Toad/Frog	1			1																		
Salamander						1																
Red-ear Turtle					1																	
Soft-shell Turtle																	1					
Stinkpot													1									
Musk/Mud Turtle								2					1									
Box Turtle	3	9	28	1	5	1				2			5		2							
Slider/Cooter			1		8	1		1				1										
Indet. Turtle	3	30	36	33	113	17	6	19	6	23	64	5	14	3	2	2	8	3	2			
Viper								2														
Non-ven Snake	1							1	2	2												
Indet. Snake	1	2	1	1				2		1	4											
Spiny Lizard										8	42											
Indet. Lizard			1								9	1			1		1					
Prairie Chicken						1																
Indet. Bird, sm			1	1							2										3	
Indet. Bird, med					1			1			1							1				
Indet. Bird, lg			2																			
Opossum	11	1																				
Cottontail		4	6	5	11	11		9	5	1	21	2					3			1		
Jack Rabbit											1											
Indet. Rabbit			1															1				
Tree Squirrel		1	1		2		1		1		20	2										
Ground Squirrel																	1					
Pocket Gopher			1	1		5		2	1													
Pocket Mouse			2																			
White-footed Mous	1			1																		
Beaver				6	2																	
Woodrat											1											
Cotton Rat		4	5	11	4	3		7		2	2						1					1
Vole	1		4			5		1	2	2	1	2										
Indet. Rodent	4	5	6			19		15	2	6	22	1					1		2		2	1
Dog/Coyote					5					1	2	1										
Raccoon				2	1												1					
Carnivore					2																	
Deer		2	2		10	1		1	3	7	38	3		1	40	5	30	1	2	1		
Pronghorn				15																		
Deer/Pronghorn	1	14	5	19	53	16	2	12	31	12	18	6	11	1								
Bison															1		9					
Indet. Mammal, sm		2	3	4	4	5	1	15	13	12	10	10					2	4	8			
Indet. Mammal, m	5	5	3	12	19	11	1	4		1	3	3	1				1	6	5			
Indet. Mammal, lg		6	1	3	8	3	1	12	13	15	4	1			2		7		1			
NISP	32	86	111	117	249	102	13	106	79	95	266	38	33	12	48	7	70	26	20	2	7	2
# of Taxa	11	14	21	17	17	16	7	17	11	15	20	13	6	4	6	2	14	7	6	2	3	2

Faunas identified from all of the features at 41CO144 are listed in Table 9.13. Of the five features, Feature 5 was not the largest feature, but it produced the most taxa. All totaled, 2,535 bones were recovered from features; of that total, 63% came from fine-screened samples.

Block 3 is composed essentially of Feature 5, which is of uncertain temporal affiliation. Most of the faunal material was from fine-screened samples.from Feature 5. Thus, the relatively large number of taxa (28) for this block is in part related to the methods of screening; the assemblage is composed primarily of rodent elements and artiodactyl tooth fragments, which have inflated the bone counts in this block. Over 70% of the bones from Block 3 came from Levels 3 and 4 of this feature. Likewise, most of the burned bone from the entire site was recovered from Block 3, undoubtedly associated with this feature as well. The paucity of post-cranial remains from large game animals, and even the lack of the usually high numbers of turtle shell fragments, make this fire-related feature anomalous for sites of all time periods in the reservoir.

One possibility is that this feature represents a natural accumulation of faunal debris perhaps associated with woodrat activity. Neotoma are not particularly common in the assemblages under present study, but here, a minimum of four individuals are estimated. Also known as "packrats," these rodents have a habit of collecting bones and other bits of detritus. It is further possible that the flotsam that collects after flooding or the hole made by a tree fall would have attracted these and other rodents. Although any of these possibilities might have provided a source procurement area for humans to collect rodents for food, it is more likely a natural feature.

In terms of edible meat, deer provided the most protein throughout all of the occupation levels at 41CO144. In Block 1, however, the presence of a single pronghorn tooth resulted in the necessity of assigning non-discriminating elements to a deer/pronghorn category. The presence of pronghorn in the assemblage indicates exploitation of grassland habitats, and the return to the site of the entire carcass (as evidenced by the presence of a non-utilitarian cranial element) suggests that this habitat was within a reasonable distance for hunting. In terms of edible meat, the elements represented by these two taxa may be combined for estimation of MNI. Figures 9.10a,b show the distribution of carcass portions and estimation of MNI for each level of Blocks 1 and 2. Each individual represents roughly 45 kg (100 lbs) of meat (White 1953).

Level 6 of Block 1 is typical of deer butchering residue in which all parts of the carcass are represented in proportion to the element composition of each grouping (i.e., some groupings have more elements to count, such as phalanges) and to the durability of the elements of each grouping (i.e., metapodials are more durable than vertebrae). Utility of each grouping must then be considered; one would expect more non-meaty elements left at a butchering station than at a consumption/disposal area.

In the graph for Block 2 (Figure 9.10b), level 0 represents all of the deer elements recovered from general surface collections and wall cleaning. As a random control sample, it is interesting that this sample reflects the so-called typical pattern as found in level 6 of Block 1, with the exception of phalanges. Otherwise, the levels in Block 2 demonstrate the scarcity of deer elements relative to Block 1.

Thirty elements show butchering marks. Two of these are from medium-size mammals, and the rest are deer/deer-size elements. They range from deep cuts to slight cuts and those that can be recognized as filleting or dismembering cuts by their placement on particular elements. Two clusters of butchered bones occur in Block 1: in level 6 (Units S1-2/E7), a cluster of deer elements with small random cuts on a femur shaft, a lumbar vertebrae, and a deeply cut astragalus were found with a metacarpal condyle with apparent skinning cuts; and in levels 11-12 (Units S4/E7-8), dismembering cuts were found on parts of an entire carcass (skull, scapula, rib, acetabulum, femur, calcaneum, and metatarsal). In Block 2 level 2, the cut deer elements cluster in four adjacent units (S8-9/E8-9); they involve a rib, humerus, and metacarpal, as well as hind leg ankle joint. Fragments of bone tools were also found in these two blocks (Table 9.14).

Table 9.14 Bone Tools, 41CO144

Block (lv) Unit	Element	Comment
1(3) S3/E8	long bone splinter	burned, cylindrical tapering tip ("awl")
1(7) S4/E8	splinter	burned, flat and thin, tapering tip
1(10) S4/E7	long bone shaft fragment	preform w/ring and snap cut remnant
2(2) S7/E8	splinter	thin and flat, parallel sides, mid-tool fragment
2(2) S8/E7	dist. metatarsal	preform; deeply scored down nutrient canal
2(2) S9/E9	long bone splinter	complete "bodkin"/"awl"; 11cm long; subtriangular, tapering to conical tip

Table 9.11 Identified Taxa from Block 3, 41CO144

Level	1	2	3	4	5	6	7	8
Toad/Frog				1	1			
Slider/Map Turtle						1		
Box Turtle		2	1	1				
Indet. Turtle		1	4	7	6	3		
Non-poisonous Snake		3	3	4	1	1		
Indet. Snake			1	1			2	
Indet. Lizard		2		1				
Indet. Bird, large						1		
Indet. Bird, medium			1	1				
Indet. Bird, small		1						
Opossum			3					
Shrew				3				
Cottontail			15	7	1	1		1
Jack Rabbit				1				
Indet. Rabbit						1		
Fox/Gray Squirrel			3	2	1	1	1	
Pocket Gopher			5	1	2			
Pocket Mouse				1		1		
Deer Mouse		1	1	2			1	
Harvest Mouse			1					
Cotton Rat		5	45	82	3	1	1	
Woodrat			19	12	1			
Vole				4		3		
Indet. Rodent		12	220	156	32	7	5	
Skunk/Weasel			1					
Carnivore				6				
White-tailed Deer		1	4	1	5	2	3	3
cf. Bison			1	9				
Indet. Mammal, large			279	13	1			
Indet. Mammal, medium		36	26	78	10			
Indet. Mammal, small		3	6	1	1	2		

Table 9.12
Identified Vertebrates from all Blocks, 41CO144 (*1).

Taxon **Blocks (*2)**	**1**	**2**	**3**
Gar sp.		24	
Catfish	1		
Indeterminate Fish	6	2	
Toad/Frog	9		2
Salamander sp.	1		
Slider Turtle	1		
Musk Turtle	1		
Musk/Mud Turtle	3		
Box Turtle	54	2	4
Soft-shell Turtle		1	
Indeterminate Turtle	384	16	21
Non-poisonous Snake	5		
Viper	2		12
Indeterminate Snake	12		4
Spiny Lizard	50 (*3)		
Indeterminate Lizard	11	2	3
Prairie Chicken	1		
Indeterminate Bird, large	2		1
Indeterminate Bird, medium	5	1	2
Indeterminate Bird, small	4	3	1
Opossum	12 (*4)		3
Shrew			3
Cottontail	74	4	25
Black-tailed Jack Rabbit	1		1
Swamp/Jack Rabbit	1	1	1
Beaver	8		
Fox/Gray Squirrel	28		8
Ground Squirrel		1	
Pocket Gopher	10		8
Pocket Mouse	2		2
Deer Mouse	2		5
Harvest Mouse			1
Cotton Rat	38	2	
Woodrat	1		32
Vole	18		
Indeterminate Rodent	80	6	326
Skunk/Weasel			1
Raccoon	3	1	
Dog/Coyote	9		
Carnivore	2		6
White-tailed Deer	68	74	18
Pronghorn	15 (*5)		
Deer/Pronghorn	211		
Cow/Bison/Elk		10	10
Indeterminate Mammal, large	67	10	293 (*5)
Indeterminate Mammal, medium	68	12	150 (*5)
Indeterminate Mammal, small	44	14	13

Table 9.12, cont.

Identified Vertebrates from Backhoe Trenches 1 and 5

Box Turtle	9
Indeterminate Turtle	17
Non-poisonous Snake	10
Indeterminate Snake	1
Wild turkey	1
Cottontail	1
Beaver	1
Deer	9
Pronghorn	1
Deer/Pronghorn	64
Cow/Bison/Elk	2
Indeterminate Mammal, large	1
Indeterminate Mammal, medium	3

Notes:
*1 Values are number of identified specimens.
*2 Blocks 1 and 2 are attributed to Late Archaic
Block 3 is possibly Late Prehistoric II.
*3 Mostly preserved scales; probably intrusive.
*4 Probably one entire individual.
*5 Tooth enamel fragments.

Table 9.13 Fauna from Features, 41CO144

Feature 1, Block 2 (lv. 2), 1.2x1.4 m, 10 cm deep
Described by excavators as in situ burning.

gar	4
swamp/jack rabbit	1
unidentified	11

Feature 2, Block 2 (lv. 2), 95x125 cm, 10 cm deep
Described by excavators as in situ burning.

indet. lizard	1
mammal small	2
indet. rodent	1
unidentified	17

Feature 3, Block 2 (lv. 3-4), 55x60 cm, 13 cm deep
Described by excavators as a basin-shaped hearth.

indet. lizard	1
mammal small	2
mammal medium	5
indet. rodent	2
unidentified	210

Table 9.13, cont.

Feature 5, Block 3 (lv. 3-5) & BHT 2, 22 cm deep
Described by excavators as a hearth.

toad/frog	2
indet. turtle	3
indet. snake	2
non-ven.snake	6
indet. lizard	1
bird medium	1
opossum	3
shrew	2
cottontail	16
blk-t jack rabbit	1
squirrel	5
pocket gopher	4
pocket mouse	1
deer mouse	4
woodrat	26
cotton rat	109
harvest mouse	1
vole	4
indet. rodent	321
carnivore	6
mustelids	1
deer/pronghorn	1
bison	10
mammal small	5
mammal medium	82
mammal large	288
unidentified	1,224

Feature 6, Block 1 (lv. 8), 52x21 cm, 6 cm deep
Described by excavators as a hearth.

fish small	1
indet. turtle	6
squirrel	1
mammal small	1
deer/pronghorn	1
unidentified	130

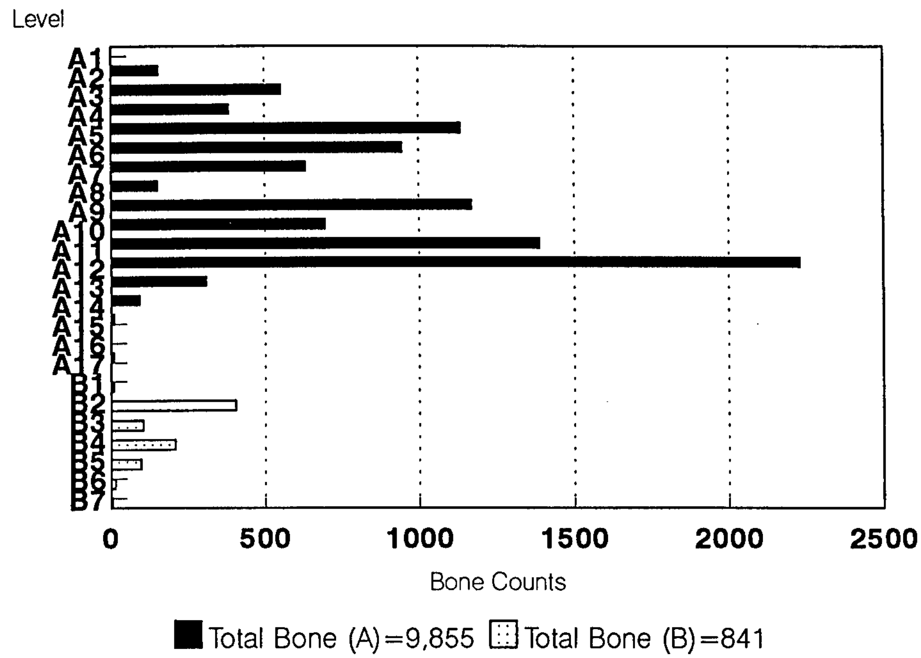


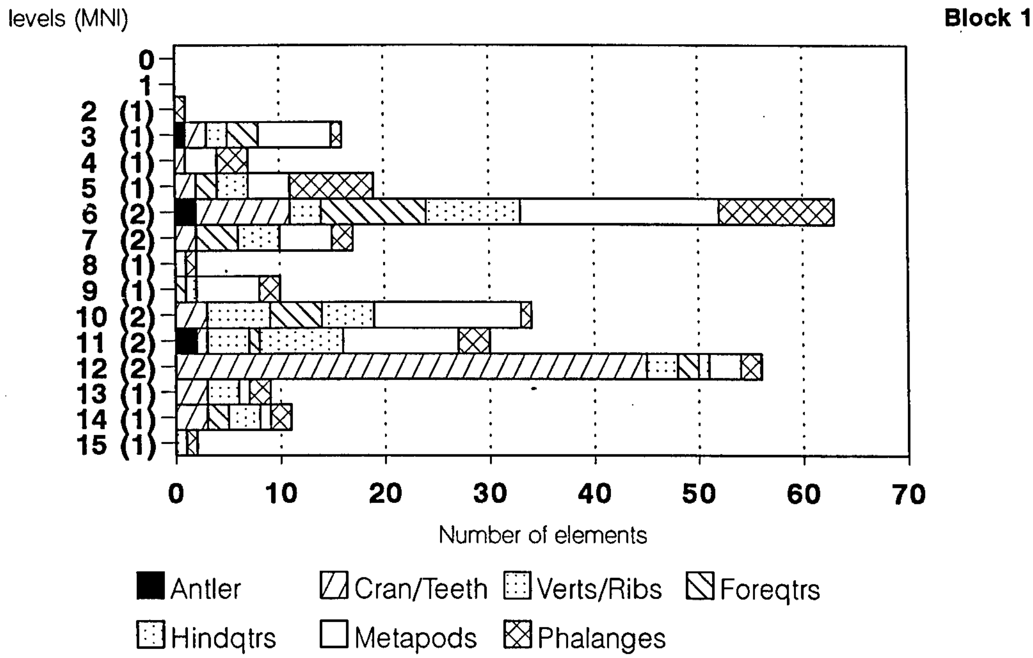
Figure 9.9 Total bone recovered per level, 41CO144. Block 1 (A) and Block 2 (B).

Taphonomy was examined for the deer/deer-size elements in Block 1 only; Blocks 2 and 3 did not have enough material to demonstrate patterning. Figure 9.11a, however, exhibits comparable patterning to that found in the data from 41CO141. The chart for exfoliation, etching, and gnawing shows the same tracking tendency that was shown at 41CO141. While small sample sizes cause problems in interpretation, there is a correlation between sample size and pedogenic calcium carbonate concentration; in levels 4 and 5, for example, low levels of carbonates (see Figure 9.2) would permit destruction of bone, and therefore fewer bones would survive with surfaces intact enough to detect etching or exfoliation. This is apparent in both charts for Block 1: Figure 9.11a shows etching and exfoliation are low in levels 4 and 5, and Figure 9.11b shows deterioration is high in those same levels. In levels 7-11, there are more carbonates, and so there is an overall increase in the representation of etching and exfoliation (a), as well as a decline in deterioration (b). At present, there is no explanation for the pattern of gnawing on the bones of these levels.

Burned bone seems to correlate with artifact density, suggesting a link with occupational intensity. Figure 9.11b also shows the same pattern of negative correlation as at 41CO141 (see Chapter 10), where a high representation of burned elements contrasts with a low representation of deteriorated elements. Considering just the data for deterioration, there is better preservation with depth of burial. At this site, the geology indicates rapid burial in the lower levels and a slower rate of deposition through time, with the concomitant increase in deterioration of bone.

Faunal Summary

The animal bone from 41CO144 comes primarily from the main occupation levels (4-6) of Block 1, with indications of other faunal concentrations in levels 9-13 from one deeply excavated, fine-screened unit from that block. The composition of faunas portrays exploitation of multiple habitats typical of bottomland environments. The site had access to grassland faunas (e.g., pronghorn, bison, prairie chicken), wooded edge



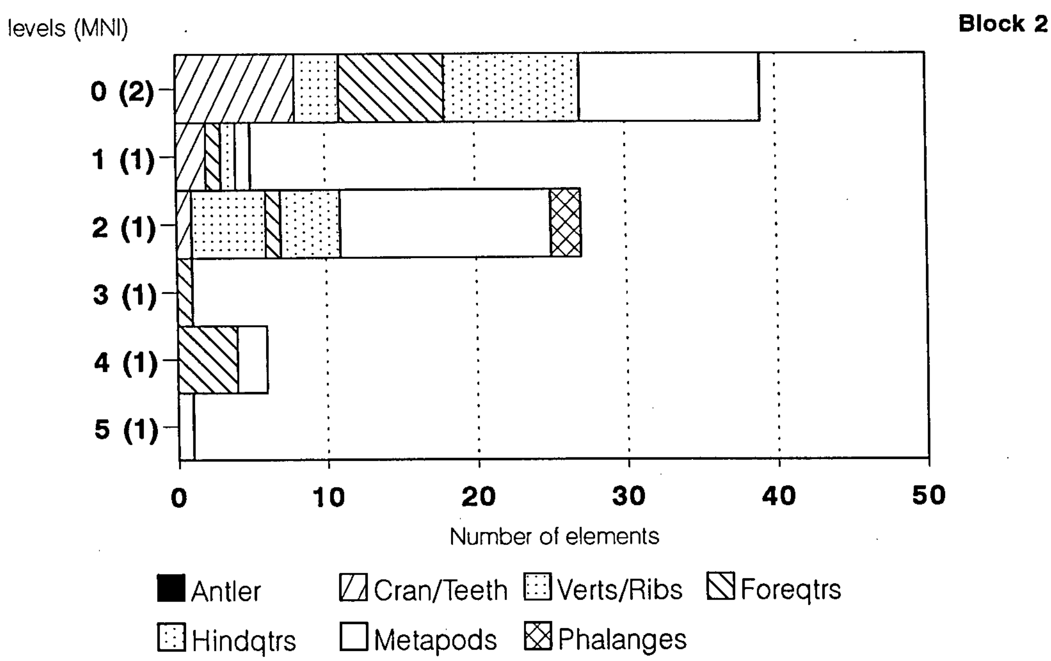
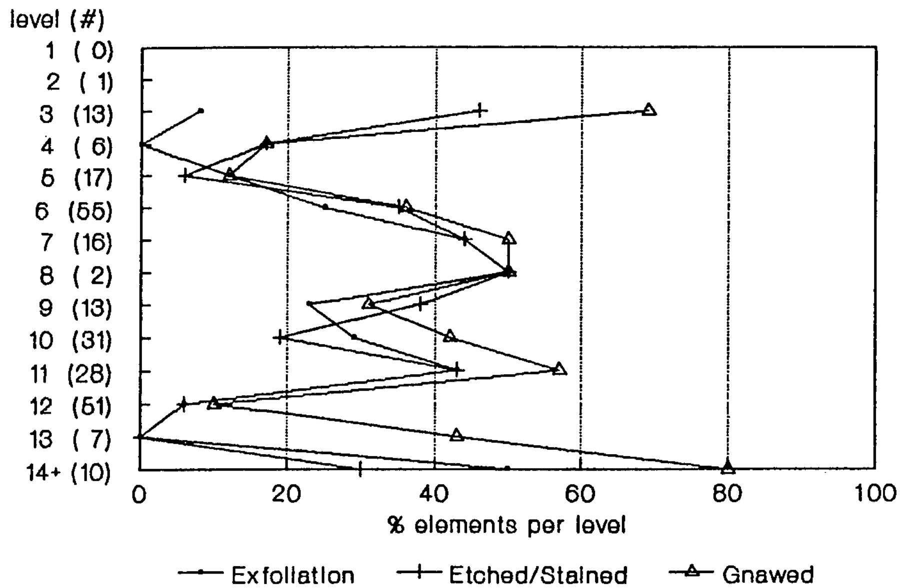


Figure 9.10 Vertical distribution of deer carcass parts, 41CO144.



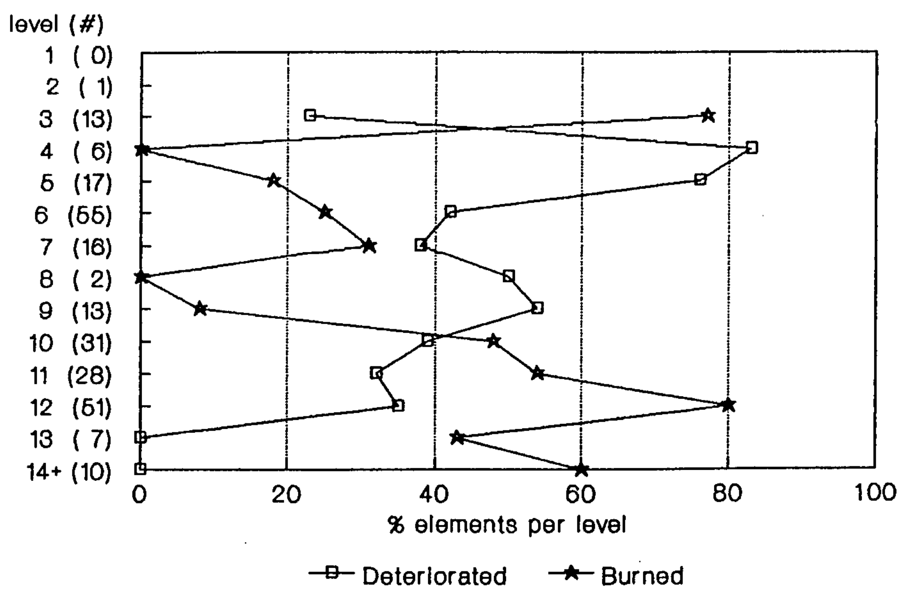


Figure 9.11 Taphonomy of post-cranial deer elements, 41CO144.

dwellers (e.g., deer, turkey, rabbit, box turtle), and riparian denizens (e.g., raccoon, beaver, salamander). Exploitation of the water course is also indicated by the presence of fish and aquatic turtles. Procurement of aquatic turtles and salamanders suggests warm weather activities when these species are active. Because of the abundance of small rodents and tiny frogs recovered from flotation and fine-screened samples, the role of microfaunas may be exaggerated at this site. If their presence in the archaeological contexts of the site is purely natural, they nevertheless provide evidence of a high species diversity in the catchment area.

Even though some of the elements in the deer/pronghorn category probably are attributable to pronghorn, the 15 pieces credited to pronghorn in Table 9.10 all come from one locus in level 5 and are all tooth fragments. Deer teeth, conversely, occur in nearly all of the units and all of the levels. It is from deer, therefore, that most of the post-cranial elements derive.

SUMMARY

The Late Archaic archaeological record at the Jayrn Site registers several similar patterns to that from the Gemma Site. Repeated occupations are documented by a stratified series of artifact assemblages and features. Given the small areas of excavation, it is likely that spatial bias is an important factor in the apparent character of the recovered materials, and that occupation episodes between the areas of major excavation were just as intense as those documented here. Clearly, the site was occupied repeatedly the late Holocene. The site would not appear to have been used as intensively as the Gemma site, based on the number and kinds of features, yet artifact and faunal densities at the Jayrn site are, in several horizons, quite high. Small excavation areas may explain this difference, or, the occupations here may have been different in character.

The features, artifacts and faunal assemblages suggest foraging of local food resources during brief repeated occupations. Deer provided the bulk of the meaty food, yet an array of smaller game and aquatic resources were procured. Tool manufacture was limited, and it is probable that many of the tools were imported to the site, especially those made from regional cherts. Features here differ from those at the Gemma site in that burned rock is much less abundant. This difference is matched by low densities of mussel shell, although there is only suggestive data that rock-lined hearths are associated with mussels.

The span of occupations here is limited to the Late Archaic. No mixture with younger occupations is indicated. The small tool assemblages do not record any significant change in tool types, although increased use of chert in the upper part of the site is indicated for one level. However there is more variation among adjacent levels than there is a true temporal trend in raw material use. This suggests that there were clearly distinct serial occupations on the one hand, and rather erratic patterns of raw material procurement on the other. The pattern here cannot, therefore, fully support nor contradict the patterns of raw material use change documented at the Gemma site.

CHAPTER 10
THE BOBBY D SITE (41CO141)

INTRODUCTION

The Bobby D site is a stratified, multi-component site complex located on the Elm Fork Trinity River floodplain near its confluence with Spring Creek (Figures III.1, 10.1). In several geologic contexts dispersed over several hectares, Late Archaic and Late Prehistoric occupation horizons are preserved. These were the focus of limited initial investigations following discovery of the site by Dan Prikryl in 1986 (Prikryl and Yates 1987) and later during the mitigation phase at Ray Roberts Lake.

Previous Investigations

The prehistoric component at the site was recorded in 1986 by personnel from UNT. Features and artifacts were discovered eroding from the east cutbank of the Elm Fork Trinity River. Test excavations were conducted in 1986 to assess the significance of the site (Prikryl and Yates 1987). Two blocks were excavated to recover material associated with a hearth and a human burial. Block 1986-1 consisted of ten contiguous 1x1 m units that exposed three hearths and a lithic knapping cluster. Block 1986-2 consisted of excavation of 2.3 cu m of matrix to recover a human burial associated with the Late Archaic occupations.

Additional testing included four backhoe trenches for geoarchaeological investigations (Ferring 1987b). Among these was a trench excavated in the northern part of the site, where buried archaeological materials were noted in good stratigraphic contexts. Recommendations for further work in that part of the site were implemented as part of this mitigation effort. Most of the rest of the site was severely impacted by construction activities associated with building a bridge for FM Road 3002.

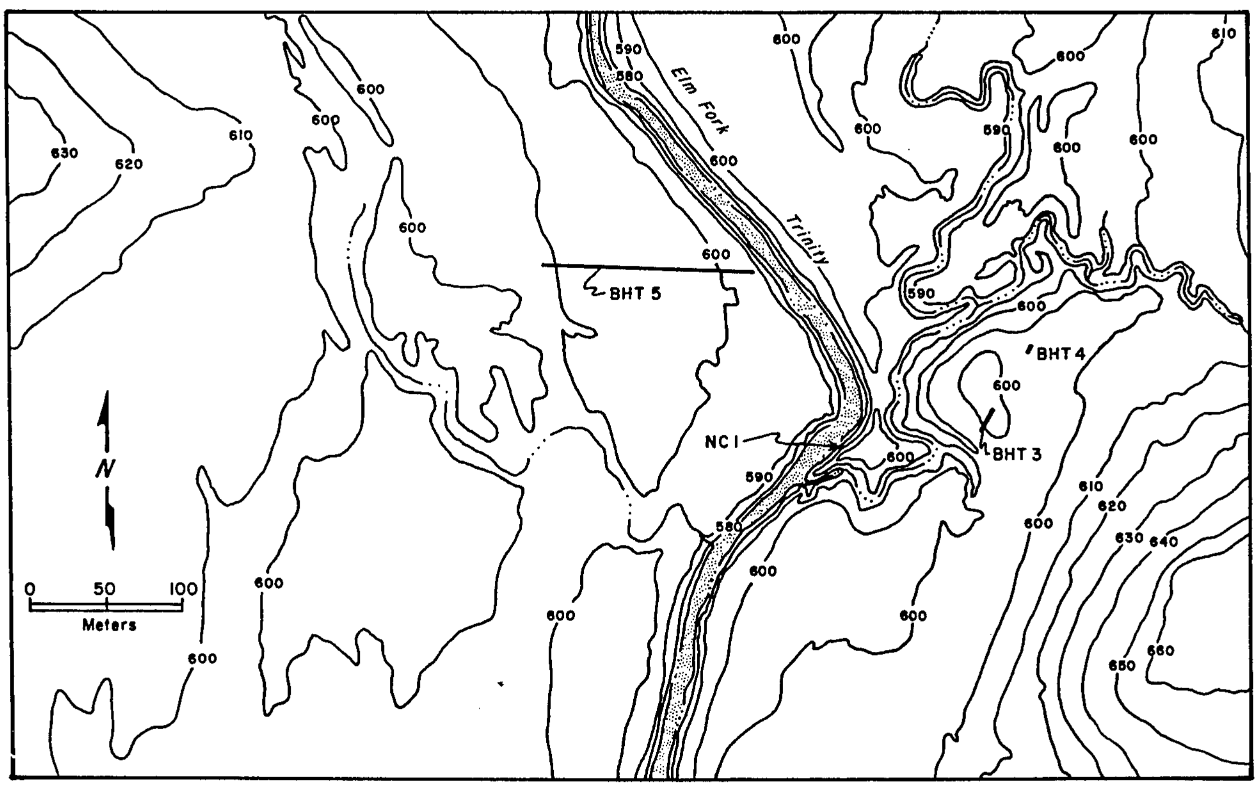


Figure 10.1 Topographic map of CO141 site area.

SITE SETTING AND GEOLOGY

Geomorphology

Much of the geologic context of this site was defined during the 1986 investigations (Ferring 1987b). The site complex is located on the eastern part of the floodplain of the Elm Fork Trinity (Figures III.1, III.3, 10.1). The site is situated close to the steep eastern wall of the valley, which is eroded bedrock. No evidence of colluvial deposition or landforms are present in the areas of excavation however.

As mentioned concerning the Jayrn Site (Chapter 9), this is a constricted part of the valley, and frequent channel shifting appears to have taken place during the Holocene. Recent channel shifts are evident in the geomorphology. Sloughs approach the site from the north, and an old channel scar encircles the area of 1986 excavations (Figure 10.1). The 1987 excavations were conducted within the area bounded by that old channel

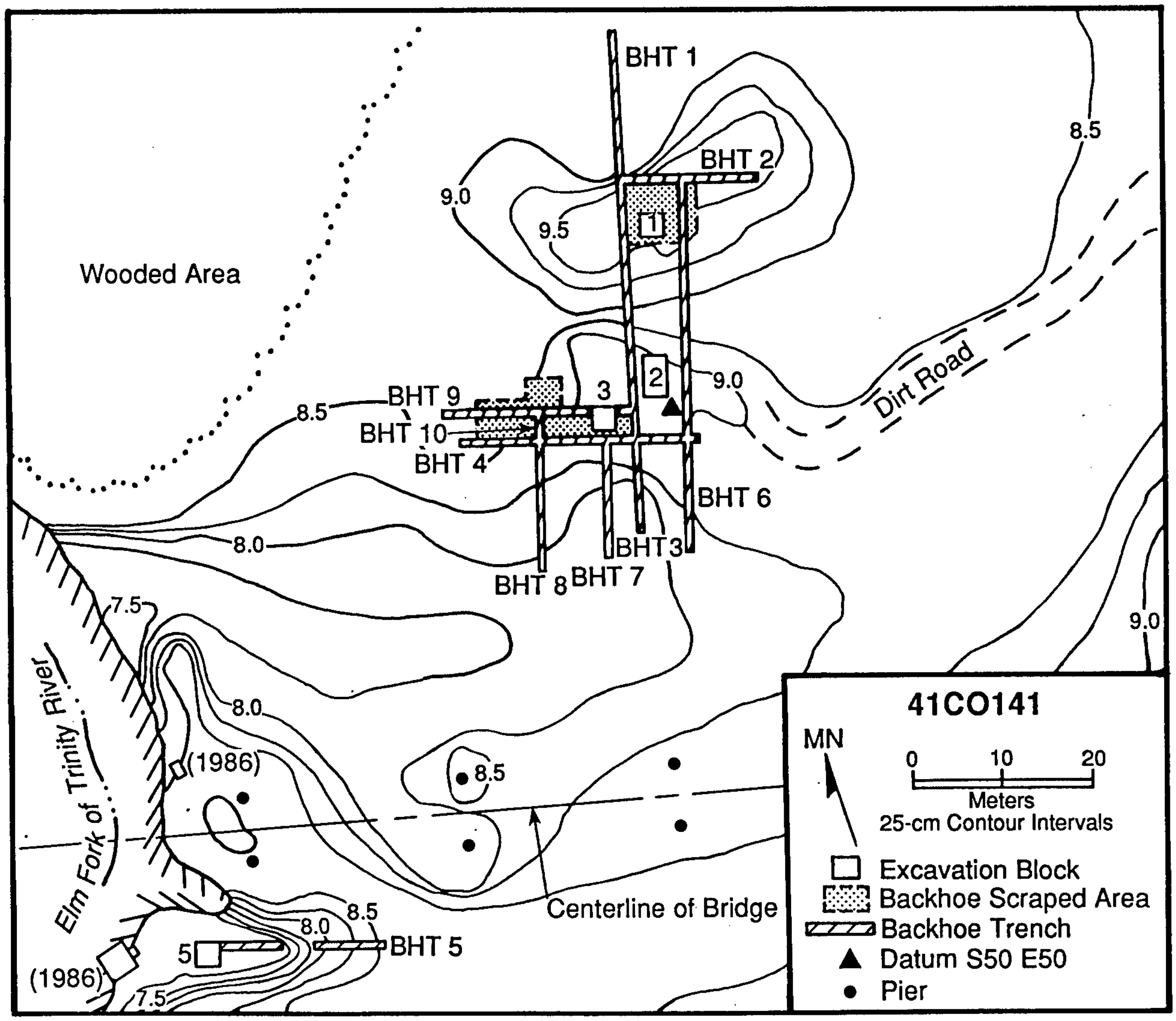


Figure 10.2 Map of excavations at CO141.

scar, on a protected remnant of the floodplain (Figure 10.2). The paleotopography of the site during prehistoric occupations was conditioned by the presence of a channel to the west and south of the 1987 excavations (Blocks 1,2). Thus, the paleosurfaces of occupation dipped slightly to the south (ie. from Block 1 towards Block 2). The modern channel has been in its present position for a relatively short time.

Stratigraphy-Soils

All of the sediments exposed during excavations at 41CO141 are Holocene. However, important differences in sedimentary environments and stratigraphy are evident. The oldest sediments in the site area are those at the base of Trench 3, excavated in 1986 (Ferring 1987b). This profile is referred to here as 41CO141, Block 2, since it was situated very close to this block (Figures 10.1, 10.2). In the Block 2 area, the sediments are texturally monotonous to a depth of about 3 m; they exhibit only a slight fining-upward trend in the lower part of the section (Figure 10.3; Table 10.1). Two stratigraphic units are recognized here. The lower one is tentatively dated to the early-middle Holocene based on soil development. The younger unit is late Holocene, and includes the A and A2 soil horizon parent materials. The younger unit appears to reflect an increase in the rate of deposition following a period of floodplain stability. The boundary between these two units is obscured by uniform texture of sediments, and by subsequent soil formation, but is estimated to be between 80-100 cm below surface.

To the west of Block 2, in the area of Block 3, an inset channel fill was exposed (Figures 10.2, 10.4). These sediments are correlated with the filled channels at 41CO144 (ie. late Holocene) and appear to pre-date the channel south of Block 2, as well as the sediments in the upper part of Block 2. This channel may be approximately the same age as the late Holocene point bar deposits exposed in the lower part of NC1 to the south (Figure 10.5). As described for sites 41CO150 and 41CO144, there is good evidence for active lateral channel shifts and meandering activity between ca. 3,000-2,000 yr BP in this part of the Elm Fork Trinity Valley. This is more evident in the constricted parts of the valley; on the other hand, these constrictions are where bridges were constructed and where, by consequence, archaeological sites have been artificially exposed. Subsurface exploration of broader parts of the floodplain was partly accomplished in 1986.

In the area of Block 2, two soils are present in the Holocene sections. The older soil is marked by leaching of carbonates and their reprecipitation in the ACk and Ck horizons (ca. 125-205 cm bs). The surface soil has formed in the younger alluvium overlying the older soil (Figure 10.3). The older soil is cumulic, with high organic content at shallower depths. This soil appears to be at least partially anthrogenic (Ferring 1987b). The high organic content and the carbonate content are probably the result, in part, from cultural activity. Accumulations of burned rock, bone and mussel shell decrease with depth below the surface in this profile, and were not evident below ca. 90cm below surface. This younger soil is "welded" to the older soil (Ruhe and Olsen 1980), and the contact between the two alluvial units is difficult to see in profile.

Geochronology

Two radiocarbon ages were determined on charcoal from Blocks 1 and 2. A sample from Feature 1 (hearth), level 5, Block 2 yielded an age of 759 +/- 70 yr BP (Beta-32529). A sample of scattered charcoal from levels 5/6 in Block 1 yielded an age of 1282 +/-90 yr BP (Beta-32530). Because of the intrusive nature of the Feature 1 hearth, which originates in level 4, these two ages appear to be in correct stratigraphic position. They also are compatible with ages from the 1986 excavations. In the 1986 Block an age on charcoal at the base of the buried late Holocene soil parent material is 1,750 +/- 92 yr BP, and an age on soil humates from the top of the soil is 965 +/- 53 yr BP (Figure 10.5). The humate age there is probably somewhat old compared to a charcoal age, owing to residence time of the humates. The new radiocarbon ages also are compatible with the artifact assemblages recovered in the 1987 excavations, as discussed below. Summary consideration of the 1986-1987 excavations at 41CO141 have yielded radiocarbon-dated assemblages of artifacts, features and faunas that range from Late Archaic (ca. 1750 yr BP) to early late Prehistoric (ca. 1300-760 yr BP).

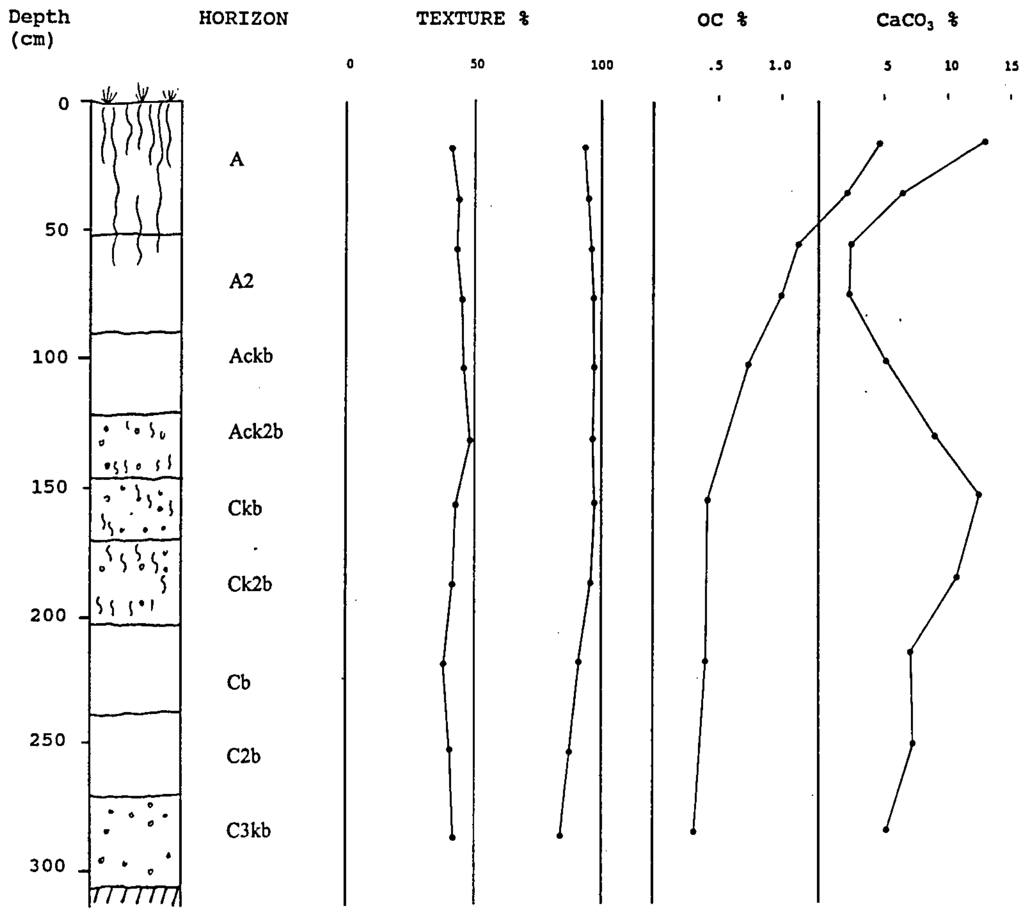


Figure 10.3 Profile of CO141, Block 2 (modified from Ferring 1987).

Table 10.1 Soil Profile Description 41CO141, BLOCK 2

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY	COMMENTS
A	0-52	10YR3/1	sC	wf sab	s rct	gs	
A2	52-91	10YR3/1	sC	sm sab	s rct	gs	
ACkb	91-123	10YR3/1	sC	mf sab	s rct	gs	
ACk2b	123-147	10YR4/1	sC	sm sab	m cc,fi	cs	
Ckb	147-171	10YR4/2	sC	wc sab	m cc,fi	gs	
Ck2b	171-205	10YR3/2	sC	wc sab	mfi,fcc	cs	
Cb	205-240	10YR4/2	sCL	ms	s rct	gs	mff mott
C2b	240-272	10YR4/2	sC	ms	s rct	gs	
C3kb	272-308+	10YR4/4	sC	ms	m cc	-	mmm mott

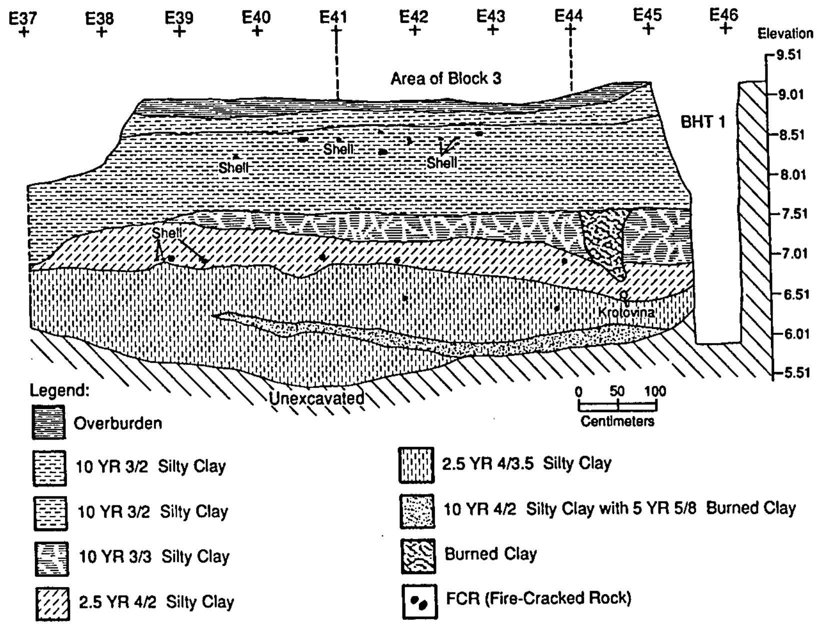


Figure 10.4 Section of Block 3 at CO141.

Archaeological Contexts

The geoarchaeological contexts at CO141 were discussed in some detail in Ferring (1987b). Subsequent excavations in the area of Blocks 1-2 reinforced those interpretations. In this part of the site, archaeological features and assemblages are contained in the cumulic soil of late Holocene age. This soil is anthrosolic as well, as shown by the high densities of burned rock, and has, in places, the appearance of a midden. Alluvial deposition promoted superpositioning of assemblages here. This may have been later affected by pedoturbation within the clayey soil matrix. Nonetheless, the fine-grained, calcareous sediments promoted preservation of bone and shell, even in shallowly buried contexts. In the deeper channel fill section of Block 3, more rapid deposition also promoted good preservation, yet the archaeological record there is scant and essentially non-diagnostic as to cultural affiliation and activities.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Strategy

Fieldwork conducted in 1987 included extensive backhoe trenching and excavation of blocks (Figure 10.1). Initially, four backhoe trenches were excavated 1.0-3.5 m in depth in high potential areas on the east side of the Elm Fork of the Trinity River. Stratified cultural deposits were encountered in each of these trenches. Results of trenching were used to place block excavations. Heavy rains and flooding of the site during excavation caused extensive slumping of the trenches. It was necessary to dig several additional trenches paralleling the original ones in order to have well exposed stratigraphy to guide the block excavations.

Two areas containing large quantities of cultural material were selected for excavation. These consisted of shallow (less than 1 m) deposits containing faunal remains and burned rocks, and also deposits greater than 2 m deep that contained burned rock and fauna. Initially, three 3x3 m blocks were established within the same grid.

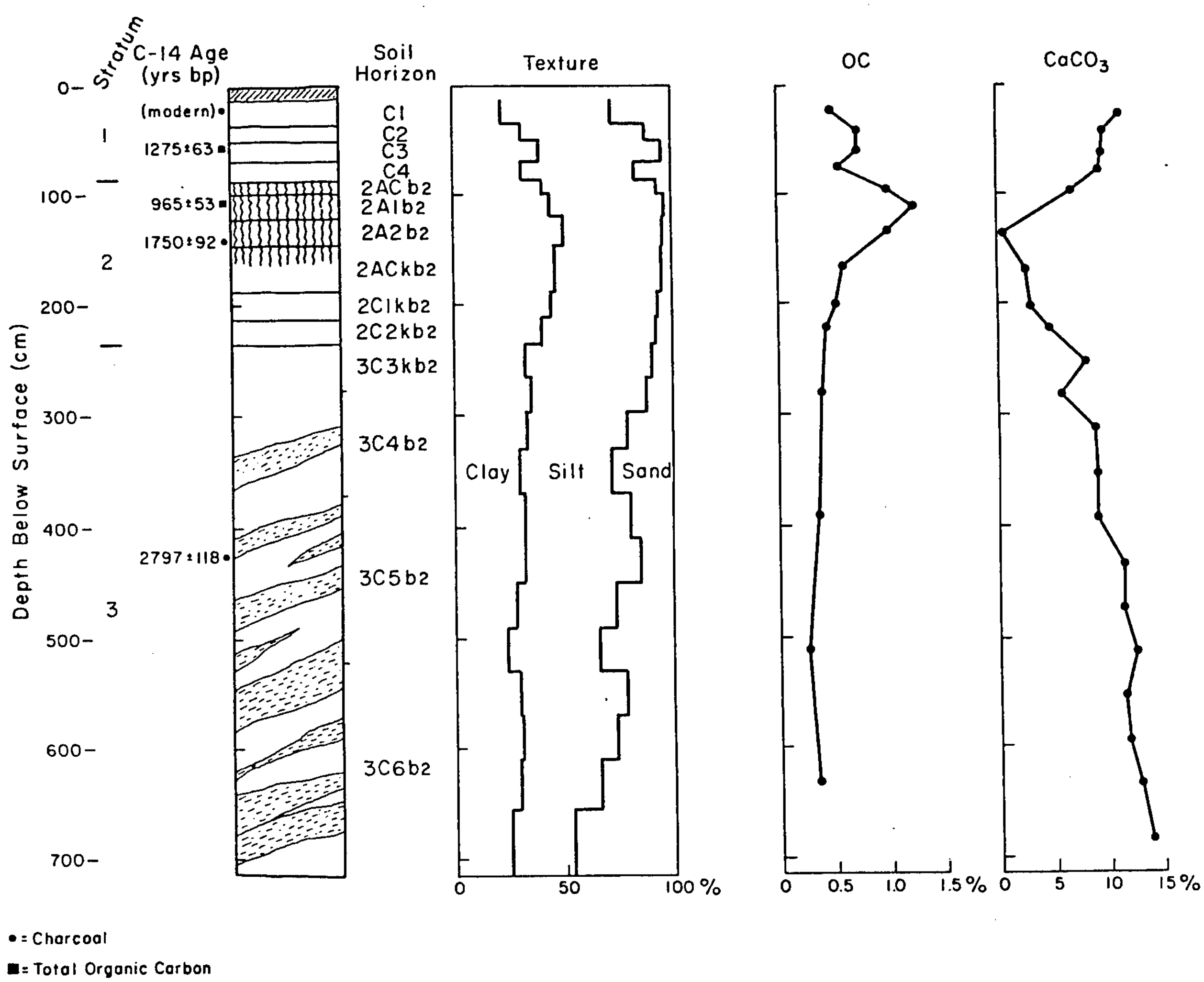


Figure 10.5 Profile of CO141, NC1 (from Ferring 1987).

Blocks 1 and 2 were placed to sample the shallow deposits while Block 3 was placed to sample the deeper deposits (10.1). Two additional blocks (4 and 5), were excavated in other areas of the site where cultural debris had been found near the surface or in other trenches. These produced no significant evidence of occupations, and were unable to further define the context of bison bones discovered on the west side of the river during backhoe trench testing in 1986, other than that they were in shallow, late Holocene sediments (Prikryl and Yates 1987).

Because of extensive construction work on the adjacent FM 3002 bridge, surface disturbance by heavy machinery was widespread. This disturbance included the removal and compaction of the surface deposits as well as deposition of spoil across the site. Prior to excavation of the blocks all spoil deposits, ranging in depth from a thin scatter to approximately 70 cm, were removed with the aid of a backhoe. The "surface" level in Blocks 1 and 2 had therefore been truncated to some degree.

Blocks consisted of contiguous 1x1 m units. Vertical control was maintained by use of arbitrary 10cm levels because of the absence of traceable stratigraphy. Matrix from the center 1x1 m unit within each block was fine screened.

Cultural Stratigraphy

Excavations in Blocks 1-2 yielded assemblages that range from Late Archaic to Late Prehistoric. Late Archaic occupations are poorly represented, but are present in the lower part of Block 1. These are immediately overlain by Late Prehistoric assemblages: first with chert Gary dart points associated with Scallorn and Alba arrow points, and then by an assemblage that contains two Washita points. Because of sloped deposits, intrusive features and probable turbation, these assemblages are recognized as assemblage zones among adjacent arbitrary excavation levels. These assemblages, features and faunas are important evidence of the age and character of the transition from the Late Archaic to Late Prehistoric periods. Notably, no ceramics were recovered.

Features

Blocks 1 and 2 yielded abundant burned rock and substantial samples of shell and bone, but relatively few lithic artifacts. Like the Gemma Site, this area of the site appears to reflect relatively intensive activities, but relatively little lithic reduction. Features in these blocks are somewhat difficult to assess owing to the small excavation area. In Block 1, for example, the 9 sq m block could be seen as being almost entirely within a feature comprised of burned rock (Figure 10.6). In Block 2, several discrete features were revealed in the several arbitrary excavation levels.

Feature 1 is a circular rock-lined hearth in Block 2 that originated in level 4 and continued into level 6. A concentration of burned earth and charcoal was found in the center of the hearth, in addition to limited amounts of burned bone and a few lithic artifacts. Stratigraphically, this feature dates to the latest occupations at the site; this is supported by the radiocarbon age of ca. 760 yr BP on charcoal from the hearth. Construction of this feature, and perhaps others, contributed to some extent to potential mixing of artifacts in this section.

Feature 2, in level 5 of Block 2, is a 70x60cm hearth, marked by a concentration of burned rock and burned clay that is ca. 9 cm deep. Contents include burned and unburned bones of deer and turtle, as well as a few lithic artifacts and mussel shells.

Feature 3 is a hearth or hearth-cleaning concentration of burned rock that was partially exposed in the east side of Block 2 in levels 4 and 5. It contained burned and unburned deer and turtle bone. The somewhat annular cluster of burned rock surrounding Feature 1, and including Feature 3, is suggestive of hearth cleaning or boiling-stone use associated with the Feature 1 hearth (Figure 10.6)

Feature 4 is a cluster of burned rocks in levels 3 and 4 of Block 1. Burned and unburned bone, charcoal, shell and lithic artifacts were associated (Figure 10.7). This feature is stratigraphically higher than Features 5 and 6.

Features 5 and 6 are in levels 4-6 of Block 1. Feature 5 is a roughly circular scatter of burned rocks that appear to represent hearth cleaning, but may have derived from serial hearth construction. Feature 6 is a discrete hearth area in the southern part of the block. Rocks associated with Features 5 and 6 were concentrated in levels 4-5 in this block. Clearly, a larger block would have permitted better understanding of the spatial and stratigraphic associations of these features, which were only partially exposed.

Feature 7 was located in the upper part of Block 3. It is marked in Figure 10.4 as the thin lens of rock and shell in the upper part of the section. In plan view (not shown) the concentration of burned rock was about 90x60 cm in area. This feature is at approximately the same elevation as levels 4-5 in nearby Block 2. But the

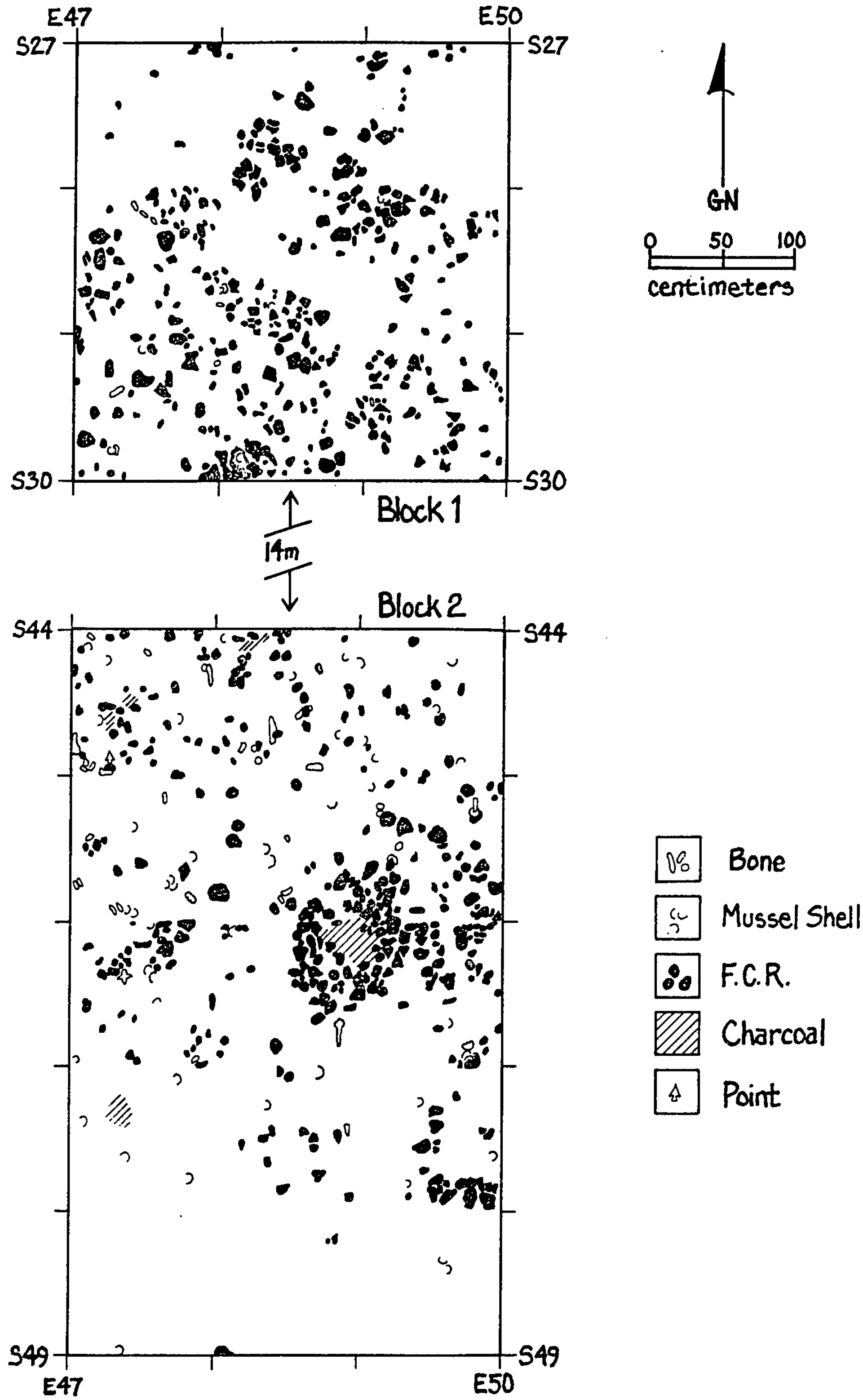


Figure 10.6 Plan of Features, CO141, Blocks 1-2. Note the distance between Block 1 and Block 2 is actually 14 m. See Figure 10.7 for feature numbers.

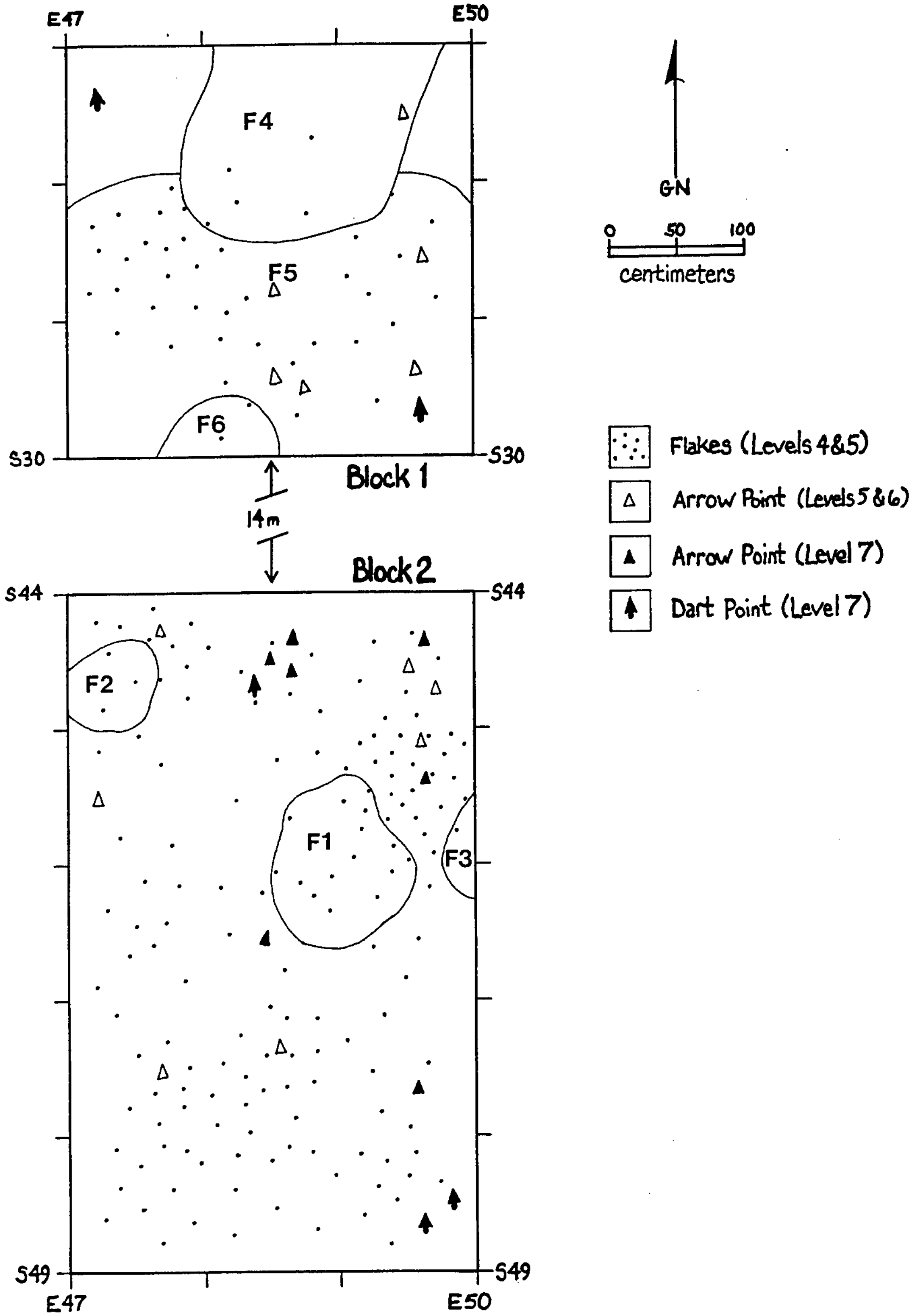


Figure 10.7 Features and artifact distributions in Blocks 1 and 2, CO141.

Feature 7 hearth was made mostly of sandstone, in contrast to the dominance of limestone in the Blocks 1-2 features. Both rock types are available as talus or in outcrop from the east valley wall near the site.

Artifact Assemblages

Excavations in this northern part of 41CO141 resulted in recovery of an important assemblage of lithic artifacts associated with occupations in the earlier part of the Late Prehistoric period. Notable is the absence of ceramics, which would be expected to be associated with the lithic artifact types recovered. Here, their absence is probably a manifestation of the activities conducted rather than a temporal-cultural expression.

In Block 2, a sample of about 700 artifacts was recovered (Table 10.2). Over 6% of these are tools, cores or blank-preforms, which is a quite high proportion compared to the Late Archaic assemblages described from 41CO150 and 41CO144. Most notable in this regard is the high frequency of projectile points (mainly arrow points) and a comparatively high number of blank-preforms. Vertical artifact distributions show a peak in levels 5 and 6, with trailing distributions above and below, suggesting a paleosurface and/or a change in sedimentation rates (Table 10.3). Because of the large burned rock features, rock densities are very high, yet artifact densities are only moderate. Mussel and bone densities are also high in the central levels and taper above and below.

Except for level 5, chert frequencies are less than 20% (Table 10.4). Cortical pieces are quite common, and large pieces are also common, although many chips are present in the whole assemblage and are not reflected in Table 10.4. All but two of the blank-preforms are made of Ogallala quartzite, and both small flake cores are also Ogallala. All of the cherts from this block are tan regional cherts. Raw materials for unifacial tools is divided evenly between Ogallala and regional chert (Table 10.5). Notable is the dominance of chert used for manufacture of dart points (Table 10.6). All of the identifiable dart points are Gary forms, and the only quartzite example is a large serrated piece that may have been a knife (Figure 10.8, 5a). The rest are small, thin chert pieces. Most of the arrow points are made of quartzite, but several of the Scallorn points are made of regional chert (Figure 10.8, Table 10.6). The arrow points include a range of types, but it is probable that they are contemporaneous. The Scallorn, Alba and Catahoula forms may be contemporaneous, as shown by discovery of a Scallorn and an Alba point in the same Late Prehistoric burial by Lynott (1978) at the Sister Grove Creek site. Both Scallorn and Catahoula-like forms exhibit serration (Figure 10.8). The latter are equivalent to the Steiner type, as discussed by Prikryl (1990).

Table 10.2 ASSEMBLAGE COMPOSITION, CO141, BLOCK 2

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	TOTAL
2	49						49
3	44		1	2	3		50
4	83		2	2	2	1	90
5	197		3	1	9	1	211
6	133	2	3	1	11		150
7	97				1		98
8	51						51
TOTAL	654	2	9	6	26	2	699
%	93.56	0.29	1.29	0.86	3.72	0.29	

Table 10.3 ARTIFACT DENSITIES, CO141, BLOCK 2

level	base lev	sq m	debden (n/m3)	artden (n/m3)	mussden (g/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
2	8.93	8	15.00	15.00	237.62	23367.5	77.50	26.84
3	8.83	8	35.00	42.50	296.50	8813.8	103.75	31.74
4	8.73	14	32.14	37.14	1173.21	24804.3	288.57	33.23
5	8.63	16	25.63	34.38	1469.25	38413.8	543.75	33.67
6	8.53	16	42.50	53.13	1853.19	16251.3	415.00	40.19
7	8.43	1	90.00	100.00	1300.00	28270.0	390.00	47.66
8	8.33	1	20.00	20.00	430.00	10410.0	140.00	46.34
Mean			37.18	43.16	965.68	21475.79	279.80	37.10
Std Dev			23.20	26.11	592.92	9693.80	165.46	7.24

Table 10.4 DEBITAGE, CO141, BLOCK 2

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
LEVEL	INT	CTX	INT	CTX	INT	CTX	INT	CTX	TOTAL	Chert %	Cortex %	Large %
2			3	2			1		6	0.17	0.33	1.00
3	9		10	4	2			1	26	0.12	0.19	0.58
4	6		18	11	2		3	3	43	0.19	0.33	0.81
5	6		15	4	5		5	2	37	0.32	0.16	0.70
6	14	3	31	8	2		4	3	65	0.14	0.22	0.71
7	1		6	1				1	9	0.11	0.22	0.89
8	1			3	1				5	0.20	0.60	0.60

The artifact sample from Block 1 is much smaller, mainly because of a smaller excavation area, although artifact densities there are lower as well (Tables 10.7, 10.8). There, artifact densities are quite uniform among levels 4-7. The major peak in burned rock density in level 5 is suggestive of a paleosurface. This corresponds with a peak in burned bone as well. The small debitage sample appears to be similar to that from Block 2 (Table 10.9). Also, as in Block 2, projectile points are dominant in the tool assemblage, yet only 2 blank-preforms were found (Tables 10.10, 10.11). In this block, two dart points were found in level 8, the lowest level excavated (Figure 10.9). The Gary and Ellis forms are indicative of a Late Archaic occupation, yet nothing else diagnostic was recovered from this level. The arrow points from Block 1 include two Scallorn types from lower levels. These are overlain by several points that are probably somewhat later. Two typical Washita points were found; one is a large piece, and the only one made of Edwards chert (Figure 10.9, 5b), the other is made of regional chert (Figure 10.9, 4a). These are associated with an indeterminate serrated point in level 5. A stemmed quartzite dart point with burin blows was found in level 4; this is assumed to have been scavenged

Table 10.5 ARTIFACT TYPOLOGY- CO141, BLOCK 2
(X/x = chert/quartzite)

CLASS/Type	LEVEL 3	4	5	6	7
BIFACES					
Arrow point	1/2*	-/2	4/3	1/6	-/1
Dart point			1/1	-/4	
UNIFACES					
End scraper, atyp.			-/1		
Side scraper		1/-			
Retouch, unilateral	2/-	1/-			
Retouch, bilateral				-/1	
BLANKS					
Blank-preform	-/1	-/2	2/1	-/1	
Biface fragment				-/2	
CORES					
Single plat. flake				-/2	
GROUND STONE					
Mano, unifacial			1		
Hammerstone		-/1			
Total	6	7	14	17	1

Table 10.6 PROJECTILE POINT TYPOLOGY- CO141, BLOCK 2
(x/x = chert/quartzite)

CLASS/Type	LEVEL 3	4	5	6	7
ARROW POINTS					
Fresno	-/1				
Scallorn				1/-	-/1
serrated			2/-		
Alba-Catahoula	-/1	-/1	1/2	-/4	
serrated		-/1	-/1		
Indeterminate	1/-		1/-	-/2	
DART POINTS					
Gary				4/-	
serrated			-/1		
Indeterminate			1/-		
Total	3	2	9	11	1

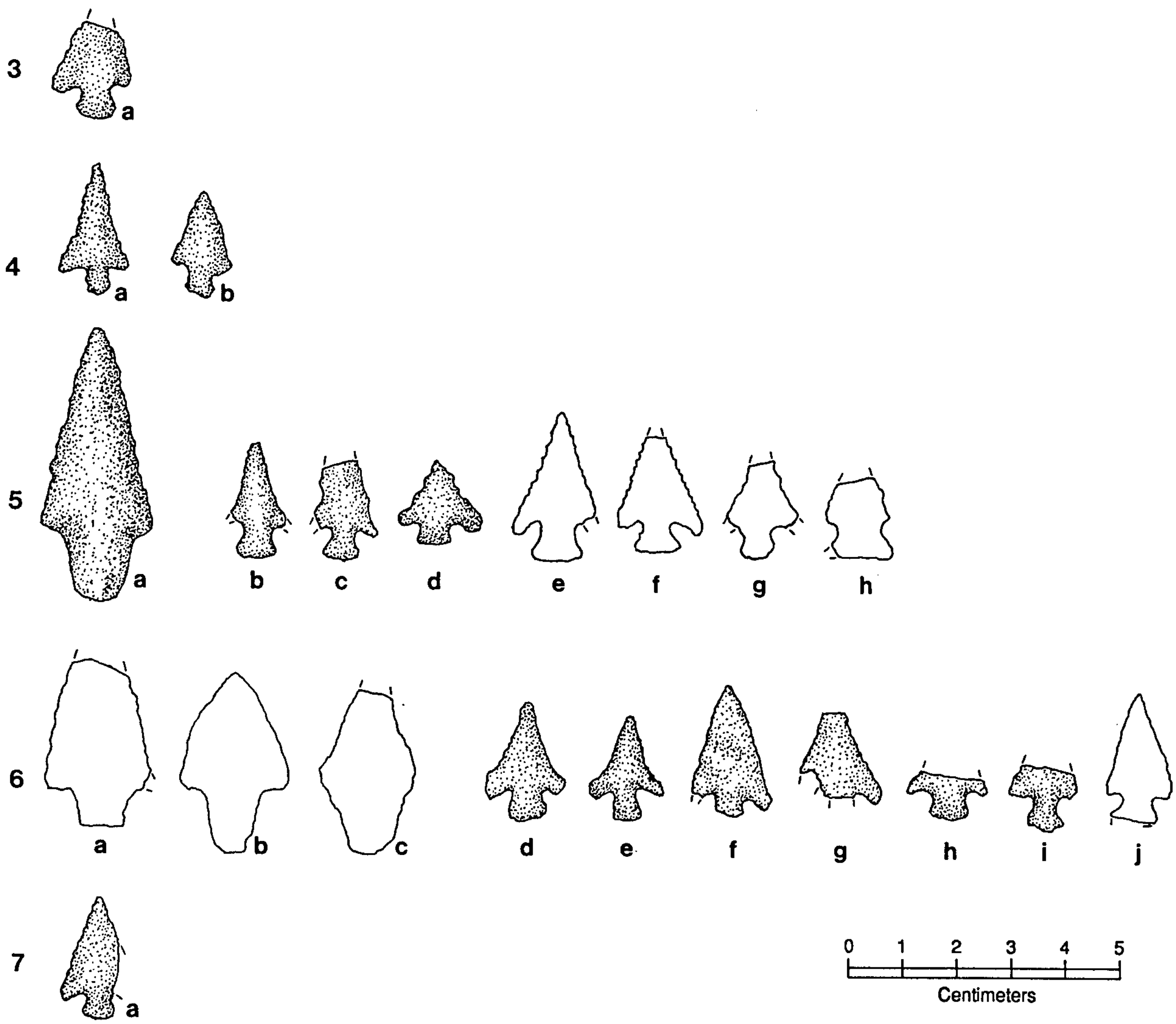


Figure 10.8 Projectile points from CO141, Block 2.

Table 10.7 ASSEMBLAGE COMPOSITION, CO141, BLOCK 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
2	3					3
3	3					3
4	12		2	2	1	17
5	43				3	46
6	45	1			2	48
7	23				1	24
8	12			1	2	15
TOTAL	141	1	2	3	9	156
%	90.38	0.64	1.28	1.92	5.77	

Table 10.8 ARTIFACT DENSITIES, CO141, BLOCK 1

level	base lev	debden (n/m3)	artden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
2	9.06	2.50	2.50	12.12	441.3	18.75	68.18
3	8.96	3.75	3.75	29.50	1487.5	13.75	31.25
4	8.86	15.00	21.25	178.25	28102.5	41.25	38.17
5	8.76	18.75	22.50	738.62	57226.3	176.25	43.10
6	8.66	17.50	21.25	687.37	27923.8	157.50	35.97
7	8.56	15.00	16.25	436.38	7603.8	110.00	29.09
8	8.46	5.00	8.75	302.75	3007.5	66.25	41.64
Mean		11.07	13.75	340.71	17970.36	83.39	41.06
Std Dev		6.49	7.99	272.64	19468.15	60.85	12.03

and reused. Level 4 yielded the highest number of retouched pieces and blank-preforms, but artifact densities are essentially the same as in the subjacent levels.

Table 10.9 DEBITAGE, CO141, BLOCK 1

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
2	2								2	0.00	0.00	0.00
3	1		2						3	0.00	0.00	0.67
4			9		1		1		11	0.18	0.00	0.91
5	3		3	6			1		13	0.08	0.46	0.77
6	3		6		3		1	1	14	0.36	0.07	0.57
7	3		4	2			1	2	12	0.25	0.33	0.75
8				3				1	4	0.25	1.00	1.00

Table 10.10 ARTIFACT TYPOLOGY- CO141, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	**L E V E L**				
	4	**5**	**6**	**7**	**8**
BIFACES					
Arrow point	-/1	2/1	2/-	-/1	
Dart point					1/1
UNIFACES					
Retouch, unilateral					/1
Retouch, dist-lat	/1				
Burin on point frag.	-/1				
BLANKS					
Blank-preform	-/1				
Biface fragment	-/1				
CORES					
Opp plat flake			/1		
Total	5	3	3	1	3

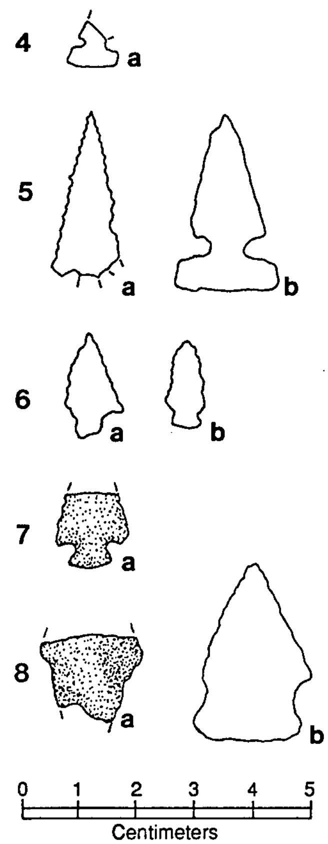


Figure 10.9 Projectile points from CO141, Block 1.

Table 10.11 PROJECTILE POINT TYPOLOGY- CO141, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	**LEVEL**				
	4	**5**	**6**	**7**	**8**
ARROW POINTS					
Washita	-/1	1/-			
Scallorn			1/-	-/1	
Indeterminate		-/1			
serrated		1/-	1/-		
DART POINTS					
Gary					-/1
Ellis					1/-
Total	1	3	2	1	2

ZOOARCHAEOLOGY

Previous excavations at 41CO141 (Prikryl and Yates 1987) included removal of a human burial from the Elm Fork cutbank and testing in two areas south of the present investigations (Figure 10.2). Faunal remains from the 1986 project were reported in Yates (1987) and consisted of approximately 2,700 fragments of which 16% were identified from 22 taxonomic categories. These remains were recovered from ten 1x1 m units in a block emplaced at the edge of the cutbank downstream from the burial; less than 100 fragments were recorded from other test units during that project, including 35 deer bones (some with butchering marks) from what would become the area excavated in the current study.

The total bone recovered from the current mitigation efforts constituted six times the amount recovered in testing, almost 17,300 fragments (Table 10.12). The largest sample, and the largest proportion of identified taxa, were recovered from Block 2 and accounted for 75% of the faunal remains from the site. As with most of the sites in this project, turtle shell accounts for a large proportion of the vertebrate remains (20 to 40% in each block). The abundance of turtle bone in the assemblages is in part due to their distinctive nature; the diversity of genera, however, is evidence of their importance in the subsistence pattern here.

Table 10.12 Total Bone Recovered, 41CO141

Locus	#Recovered	%ID	%Burned
Block 1	3,806	12.3	9.2
Block 2	13,023	16.4	17.4
Block 3	430	19.8	9.0
Block 4	2	100.0	0
Block 5	13	15.0	0
(Testing 1987)	2,700	16.0	8.7

Block 1 contained primarily Late Prehistoric artifacts in the upper levels, with Late Archaic artifacts in the lower levels. The vertical distribution of the fauna indicates a rapid increase in bone frequency starting in level 4 and peaking in levels 5 and 6 (Figure 10.10a). Block 2, which was larger than Block 1, shows the same vertical trends (Figure 10.10b). Burned bone frequency follows that trend in both blocks. Block 3 level 4 produced 41% of all the faunal remains recovered from that block; the 85 identified elements failed to add any taxa to the lists from the larger blocks. The two elements from Block 4 were from a bison foreleg, but no other artifacts or contextual clues were recovered to link this part of the site with the other blocks; neither element was burned nor modified.

Tables 10.13 and 10.14 present the identified taxa from Blocks 1 and 2 of the current study and designate the taxa that were not represented in the 1986 testing phase. Expectedly, the levels with the most bone also produced the most taxonomic categories, such as levels 5, 6, and 7 which average 16 categories, whereas the other levels average only 6. Large game animals dominate most levels, except in Block 1, levels 7 and 8, where small game is slightly dominant (Figure 10.11a,b). Five rodents and one insectivore, along with rabbits and snakes constitute the small game categories in Block 1. Likewise in Block 2, small game appears more important in levels 5 and 6, where abundant rabbit, rodent, and box turtle elements affect the distribution. (Indeterminate turtle and indeterminate mammal categories were omitted from the calculations for these figures.)

Without doubt, deer contributed the major meat component in the diet of the people who lived at this locale through time. Deer is especially prominent in Blocks 1 and 2 where two or more individuals were recorded in levels 5-7 and 4-6, respectively. Apportionment of elements in these two blocks indicates that non-

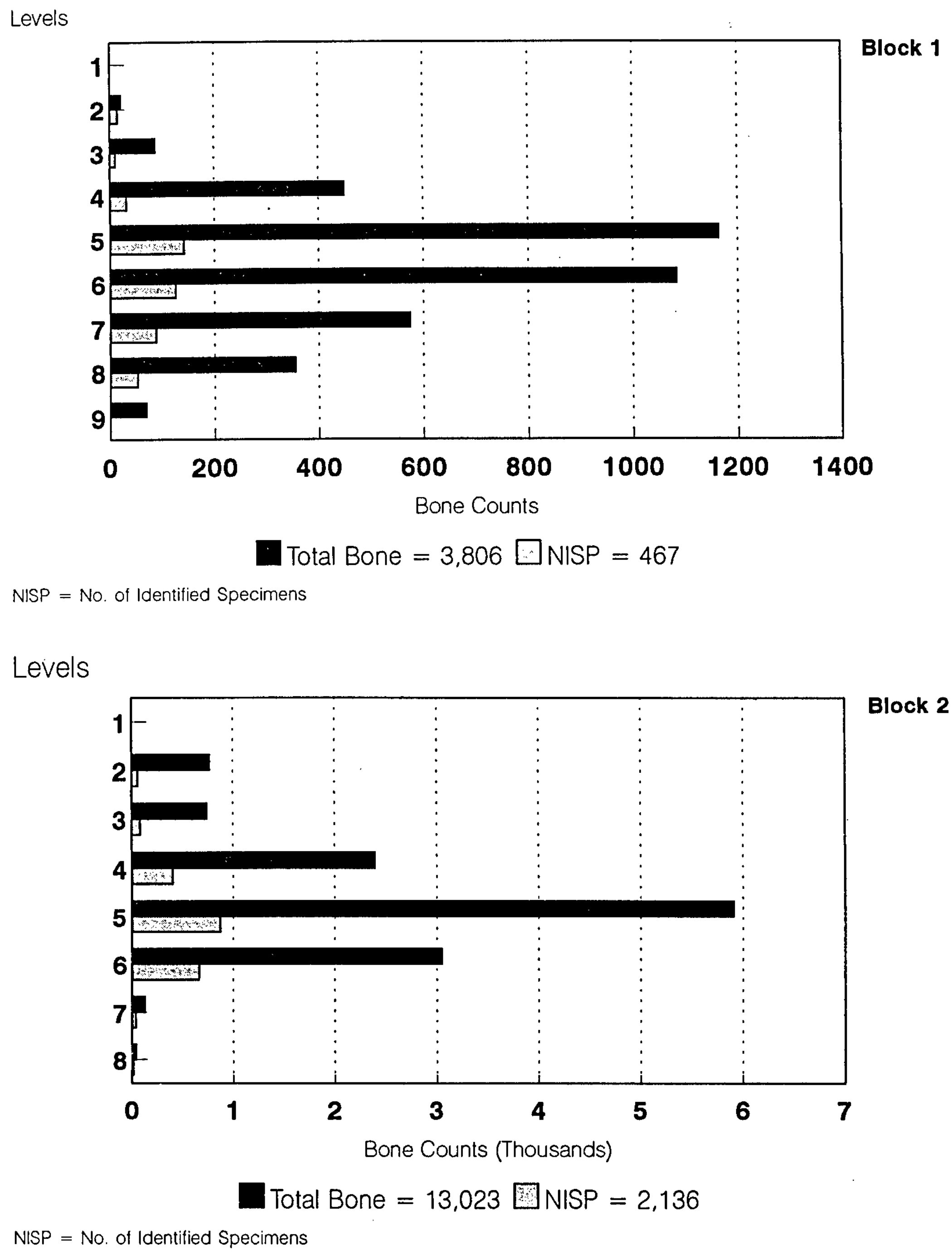
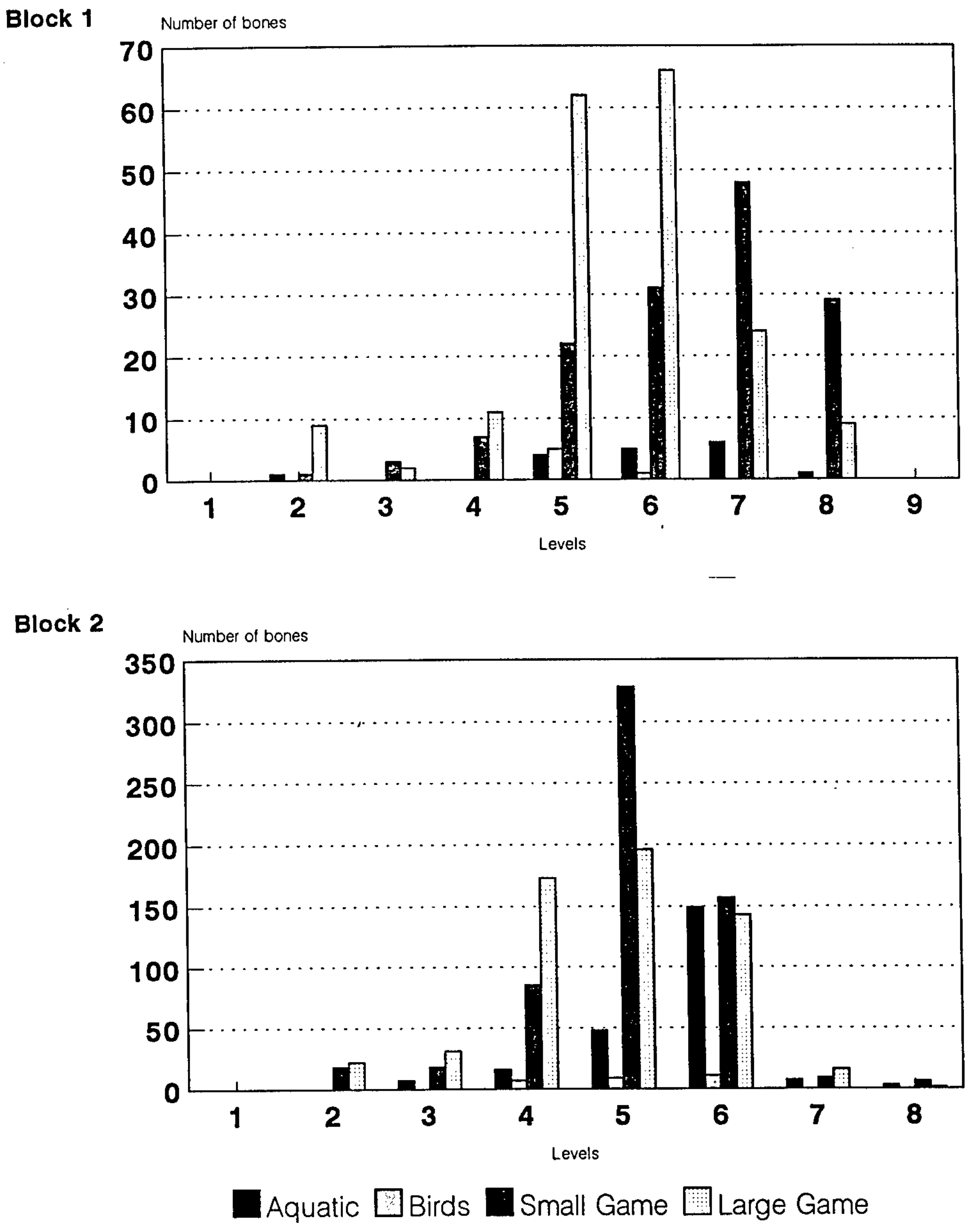


Figure 10.10 Total bone recovered per level, 41CO141.



Number of identified specimens
per quarry type.

Figure 10.11 Changes in vertebrate quarry types, 41CO141.

Table 10.13 Identified Vertebrates, CO141, Block 1

	LEVEL						
	2	3	4	5	6	7	8
Gar							1
*Catfish					1		
Bass/Sunfish					1		
Indet. Fish	1				2	1	
Slider				3		4	
Box Turtles		1	3	7		3	2
Indet. Turtle	2	4	14	43	19	8	9
*Non-ven. Snake	1			1			
*Viper					1		
Indet. Snake					2		
*Prairie Chicken				1			
Turkey				1			
Indet. Bird, lg				3	1		
*Shrew		1					
Cottontail			3	9	18	24	18
Jack Rabbit						1	
Indet. Rabbit					1		
Tree Squirrel				1	1		
*Beaver				1	1	1	
Pocket Gopher					1	1	1
*Vole				4		5	1
Cotton Rat		1	1		1	4	
Indet. Rodent					6	10	7
*Dog/Coyote							1
Raccoon				1		1	1
Deer	9	2	11	61	66	23	8
Indet. Mammal, sm				4	2	1	2
Indet. Mammal, med	2		1	1	2	1	2
Indet. Mammal, lg		2					
NISP	15	11	33	141	126	88	53
# of Taxa	5	6	6	15	17	15	12

meaty, durable elements (metapodials, phalanges, and teeth) are most common as would be expected as hunting/butchering debris primarily because each carcass has an abundance of these elements and they are usually discarded as waste (Figure 10.12a,b). Block 1 has slightly more common rib and vertebral remnants, while Block 2 has more antler represented. Meaty elements of the forelimb and hindquarters are under-represented due in part to their high utility index (i.e., high meat/marrow ratio) and consequent breakage. The presence of all body parts of deer indicates that entire carcasses were processed on site.

To assess the effects of taphonomic agents on the bone from 41CO141, post-cranial remains of deer were used (Figure 10.13). (The method employed for these figures is discussed in Chapter 8) Five taphonomic categories were used: 1) "etched/stained" to indicate minor changes on the surface of an identified element caused by chemical effects of roots or soil minerals; 2) "exfoliated" to indicate patches where cortical bone has been weathered away in layers; 3) "gnawed" by rodents or carnivores; 4) "deteriorated" to denote multiple deleterious effects such that the bone is in very poor condition; 5) "burned" either wholly or partially.

The five taphonomic categories were subdivided into two sets in order to (a) examine how progressively degraded bone (etched/stained to exfoliated) compares with bone that has been gnawed, and (b) to see what effect burning has on preservation. Block 2 provides exemplary evidence of these effects; while the pattern in Block 1 was similar, it was not as illustrative. In Figures 10.13b and 10.13c, a negative correlation is shown

Table 10.14 Identified Vertebrates, CO141, Block 2

	LEVEL						
	2	3	4	5	6	7	8
Gar				1			
Catfish			1	2	2		
Indet. Fish, sm			1	14	1		
Indet. Fish, lg					1		
Toad/Frog				4	1		
Red-eared Turtle		2	6	12	104	4	3
Cooter/Slider				1			
*Snapping Turtle					28	1	
*Musk/Mud Turtle			1	7	7	1	
Box Turtle	9	7	25	43	62	4	4
Indet. Turtle	21	26	114	277	189	7	4
*Spiny Lizard				1			
Non-ven. Snake				3	1		1
Viper				1			
Indet. Snake				5			
Prairie Chicken			1	1	2		
Turkey			1	5			
*cf. Goose				1			
Indet. Bird, sm				1			
Indet. Bird, med			1	1	1		
Indet. Bird, lg			4		8		
Opossum		1	2				
Cottontail	8	6	44	146	72	5	1
Jack Rabbit		1	1	1			
Indet. Rabbit	1			14			
Tree Squirrel			4	13	3		
Beaver		5	7	7	5	1	
Pocket Gopher		2		7			
Vole		1	3	14	4		
Cotton Rat			5	6	3		
Indet. Rodent			1	74	12		
Raccoon			1	4	4		
cf. Wolf				2		1	
Carnivore					1		
Deer/Deer-size	22	31	172	190	138	15	1
Indet. Mammal, sm	1		5	4	1		
Indet. Mammal, med			2	8	9		
Indet. Mammal, lg		1	2		5		
NISP	62	83	404	870	664	39	14
# of Taxa	6	11	23	32	25	9	6

between heavily degraded bone and burned bone, suggesting that indeed burning provides bone with some measure of resistance to deterioration (Buikstra and Swegle 1989).

In Figure 10.13a, the three effects track each other in the levels with the most bone. Gnawing was not an important aspect of bone deterioration here. The relatively higher frequency of etched/stained specimens over exfoliated specimens throughout the lower levels indicates that overall the bones have experienced less degradation from weathering factors. That exfoliated bones are almost equally represented with etched/stained in level 4 suggests a living floor at that horizon, where more bone was exposed on a surface and hence subject to exfoliation; a divergence of these values in level 5 probably is a result of deeper or more rapid burial. The peak for exfoliation in level 6 may indicate another surface.

Butchering marks were noted on meaty elements such as comprise the foreleg and hindleg bones of deer; many of these elements also had charred breaks, which may result from some marrow extraction methods (Gilbert 1973:10), or indications of differential burning, which occur when meat is roasted on the bone. Cut marks appear primarily on metapodials; most of these could be construed as skinning cuts, as well as defleshing cuts in preparation for marrow extraction or tool manufacture.

Block 1 had five bone tools made from metapodials; Block 2 had seven metapodial tools, twelve tool fragments, one antler tine tool, and five possibly worked long bones. These long bones include a radius, three humeri, and a tibia; each of these had burned and abraded distal ends as if they had been used for processing materials that had been heated, perhaps nuts or seeds. They were recovered from levels 4 (radius), 5-7 (humeri), and 6 (tibia).

Table 10.15 Summary of Bone Modification, 41CO141

	Block 1	Block 2
Bone Tools	23% (5)	29% (25)
Spiral Fractures	41% (9)	36% (31)
Cut Marks	36% (8)	35% (30)

In addition to the grinding tools, pointed tools ("awls") and splinter tools with transverse wear ("beamers") are present. One specimen from Block 2 level 6 has a faint "X" on one side of the worked edge.

Six features contained faunal remains at this site (Table 10.16). Feature B2-1 (a large, circular, rock-lined hearth) produced the most identified elements and taxonomic categories; the taxa represented in this feature are the same as for the site as a whole except it lacked remains of beaver and some of the more rare taxa. Deer, rabbits, rodents, and turtles dominate the counts in this feature. Among the turtles identified to family are the aquatic slider and musk/mud turtles and the terrestrial box turtle; the majority of the 20% burned bone from this feature is turtle shell, suggesting that the turtle was cooked whole and/or the shells were used as vessels. Only two elements of deer are burned: a metatarsal and a tarsal. Two mature individual deer are estimated from the feature fill, and all parts of those carcasses are represented, excepting antlers. The dental age of both deer fits occlusal attrition patterns of individuals between 4 and 6.5 years. The absence of antlers could be due to many factors, including sex, season (late winter/spring), or removal by the hunters. One of the worked humeri ("grinders") was found in this feature, as well as several deer bones with cut marks and spiral fractures.

One of the first features discovered was found outside one of the block excavations. Feature 1 ("Block 0") was identified by the excavators as a burned area exposed in Backhoe Trench 9, west of Block 3 (Figures 10.2, 10.4); it contained the most burned bone (49%) of any feature and the singular occurrences of quail and bat, as well as the highest percentage of rodents. Its functional-cultural nature is not apparent. The majority of rodents and small animal remains resulted from fine-screened samples from these features.

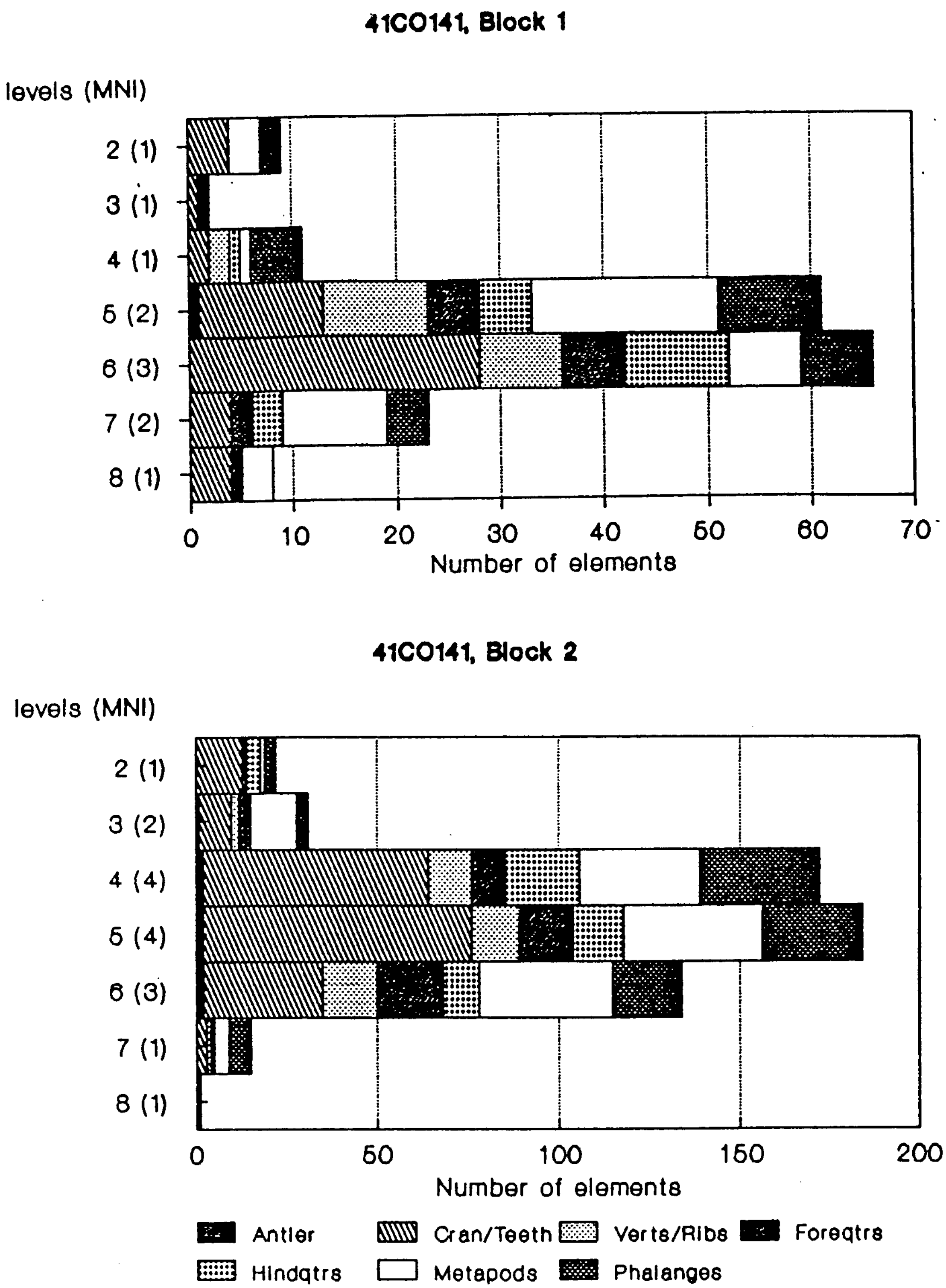


Figure 10.12 Vertical distribution of deer carcass parts, 41CO141.

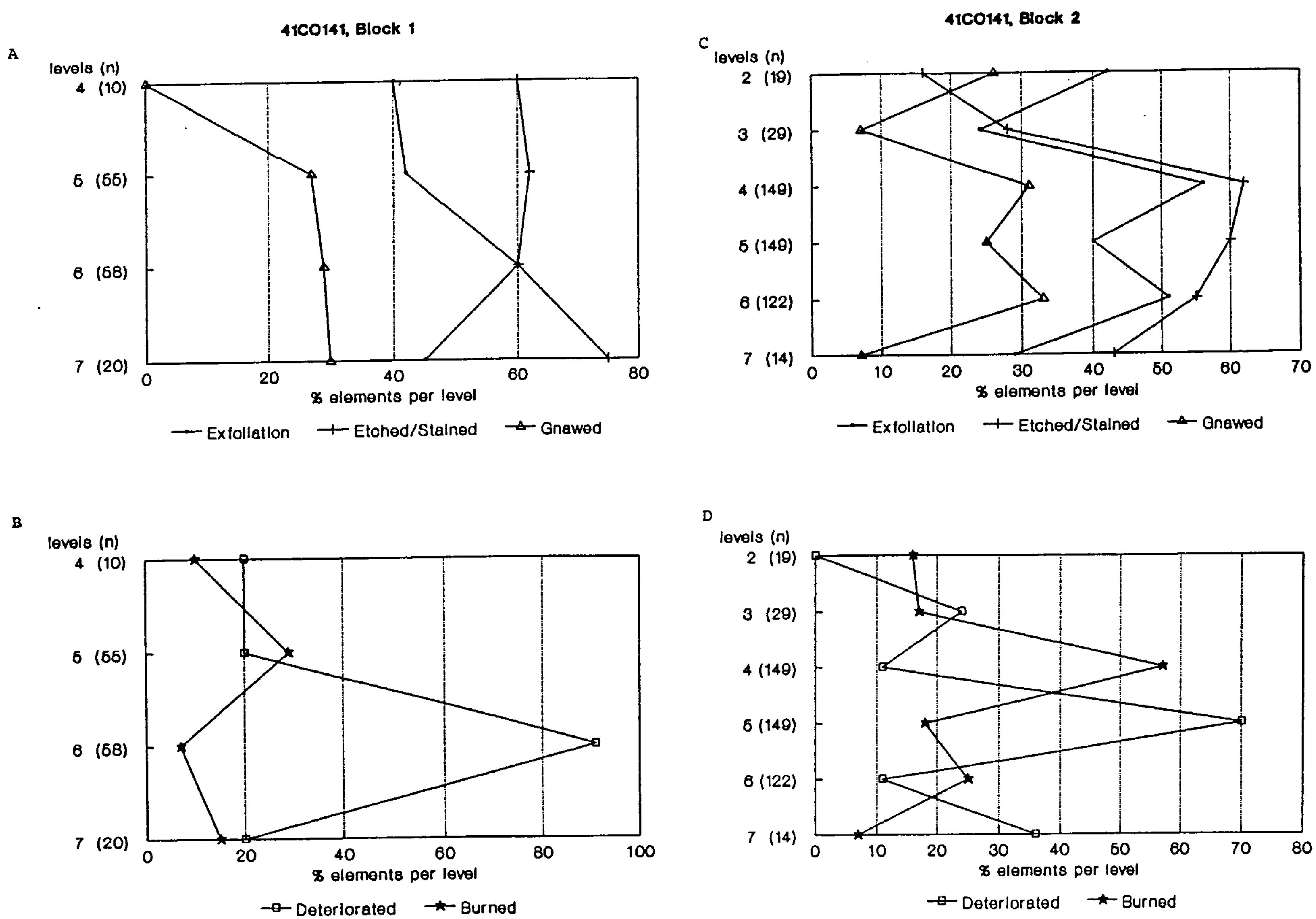


Figure 10.13 Taphonomy of post-cranial deer elements, 41CO141.

Table 10.16 Identified Fauna from Features, 41CO141

Block-Feature	Total ID	# Burned	Contents
B0-1	43	21	fish, turtle (37%), quail, bat, cottontail (2%), squirrel, gopher, pocket mouse, cotton rat, vole (all rodents 33%), deer (11%)
B1-1	55	11	fishes, turtles (27%), snake, prairie chicken, large bird, cottontail (15%), squirrel, beaver, vole, deer (29%)
B1-2	7	2	turtle, cottontail, deer
B2-1	285	59	fishes (3%), frog, turtles (33%), snakes, turkey, med. bird, cottontail (19%), jack rabbit, squirrel, gopher, cotton rat, vole (all rodents 21%), wolf?, deer (17%)
B2-2	37	8	fish, frog, turtle (16%), lizard, small bird, cotton-tail (38%), gopher, raccoon, deer (24%)
B2-3	11	2	turtle, cottontail, deer
B3-2	7		turtle, cottontail, gopher, deer

Faunal Summary

The fauna from 41CO141 depicts the residue of a Late Prehistoric hunting camp. Deer was the principal game species procured, but rabbits, rodents, turkey, quail, raccoon and beaver were hunted as well. The presence of a variety of fishes and aquatic turtles indicate that the local streams were exploited. The assemblage as a whole attests to broad exploitation of animals in riparian, woodland, and grassland habitats.

Of all the animals represented, wolf and bat seem the most unusual. Bones of a large canid paw were recovered in Block 2 (levels 5, 7), and canid or carnivore teeth came from adjacent units. Interestingly, it is represented by the same kinds of body parts as is deer and may have been a prey item. Neither of these animals is common in archaeological sites. The bat may be intrusive along with some of the smaller, fossorial taxa such as shrew, vole, and pocket gopher.

Seasonality assessments would require intensive analysis of deer annuli for each level of this sample. The site was occupied at least in the late winter as shown by a fawn whose dental age was 13-17 months at death, this assumes a normal springtime birth date. The presence of aquatic turtles, lizard, and an ambystomid salamander (Block 3) argues for a warm season occupation as well. The presence of an unspecified goose could indicate spring or fall. However, since most of these taxa came from different blocks and levels, no seasonal pattern is perceptible.

SUMMARY

Excavations in this area of CO141 yielded an important record of occupations dating to the earlier part of the Late Prehistoric period. Although massive floodplain clays prohibited detailed stratigraphic resolution, and turbation may have promoted some mixture of materials, this site appears to document episodic occupations between 1,250-750 years ago. The assemblages are aceramic, and exhibit a rather uniform emphasis on stemmed arrow points, with two Washita points associated with the later occupations of the locality. A few thin

Gary points appear to be directly associated with the arrow points, although they occur in the earlier parts of the occupation sequence.

Construction of rock-lined hearths is prominent in the activities here. They are associated with dense accumulations of mussel shell, and the Block 2 area in particular has the appearance of a midden. Overall, the subsistence pattern is very comparable to that seen in other Late Archaic settings in the Ray Roberts area. Exploitation of riverine, woodland and prairie habitats is shown, with a variety of small game and aquatic resources complimenting the dominance of deer in the faunal assemblage.

Although no architecture was documented, it is possible that structures may have been present. Evidence for these would have been very difficult to find in the black clays that contain the archaeological materials. On the other hand, a hamlet occupation would likely have left ceramics in the artifact assemblages. Their absence, and the dominance of projectile points in the lithic assemblage suggest that this was a hunting and collecting station, occupied repeatedly during the early part of the Late Prehistoric period. The features and vertical artifact distributions suggest fewer rather than more discrete occupation episodes, although this is difficult to resolve geoarchaeologically. The patterns of food processing, hearth construction and artifact manufacture-maintenance activities suggest foraging and on-site food processing rather than food preparation for export to some central location. If this site is associated with hamlets in other parts of the region, the record here suggests seasonal or periodic use of the site for brief residential occupation rather than for logistical functions.

CHAPTER 11
THE BRITT SITE (41DN197)

INTRODUCTION

Previous Investigations

The Britt Site was recorded in 1972 by SMU as 41DN8 (Bousman and Verrett 1973). The site was recorded again in 1981 as 41DN197 by ECI (Skinner et al. 1982a). A dense concentration of burned rock, lithic debris, and bone was observed eroding from the bank of an abandoned channel of Isle du Bois Creek. Three shovel tests and one 1x1m test pit (to 36cm below surface) were excavated. Despite the fact that levee deposits were reported by Bousman and Verrett, none of these tests penetrated into late Holocene sediments containing archaeological materials. Because of negative results, ECI (Skinner et al. 1982b) did not recommend additional work at the site.

The site was relocated by personnel from UNT in 1985. A surface scatter of lithic debris and burned rock was observed on the eroded bank. It was noted that a sandy loam overlaid the dark clay loam that contained the cultural remains. Recommendations were made for additional testing. The testing, conducted in 1986, consisted of four 1x1-m test pits and two backhoe trenches (Figure 11.1). The trenches were oriented east-west, perpendicular to the eroded embankment, and spaced 17.5 m apart. Backhoe Trenches 1 and 2 were 40 m and 37 m long, respectively with their depth varying from 1-2 m.

The four test pits were excavated between the backhoe trenches. Test Pit 1 was excavated to a depth of 140 cm bs. A burned limestone rock feature (Feature 1) was found below the levee deposits (Figure 11.2). Test Pit 2 was excavated to a depth of 105 cm bs. A burial of a small child (Feature 2) was found at a depth of 70 cm bs. The burial was removed in a block of matrix in order to facilitate analysis by the Physical Anthropologist and also to remove the burial prior to impending floods.

Test excavations showed a clearly in situ occurrence of artifacts, faunas and features within dark floodplain clays that were overlain by sterile levee deposits. This geologic situation compares with that at several other sites such as the Pond Creek site and the Jayrn site, and good preservation potentials were indicated. The small artifact sample recovered during testing (Table 11.1) suggested a late Prehistoric occupation, perhaps overlying a late Archaic component. Recommendations for mitigation were implemented.

SITE SETTING AND GEOLOGY

Geomorphology

The Britt Site is on the floodplain of Isle du Bois Creek, but in the broad part of the Elm Fork Trinity Valley, above their confluence. In essence it is on the Elm Fork Trinity floodplain. In contrast to sites farther upstream on Isle du Bois, the sediments at the Britt Site reflect the Elm Fork sediment supply, having less sand and more silt and clay. Deposition here was partially controlled by constriction of the Elm Fork-Isle du Bois valley at the location of the Ray Roberts Dam.

The floodplain here is flat, but in the site area the natural levee mentioned above forms a distinct ridge at the edge of the floodplain.

Stratigraphy-Soils

The site was inundated before geologic studies could be conducted; therefore the geology of the site is documented only through observations made during testing. The stratigraphy of the site includes the upper levee deposits, which are sandy. Below these are late Holocene floodplain deposits, in which a soil formed. This soil is correlated with the Late Holocene West Fork soil, and is in similar stratigraphic position as at sites such

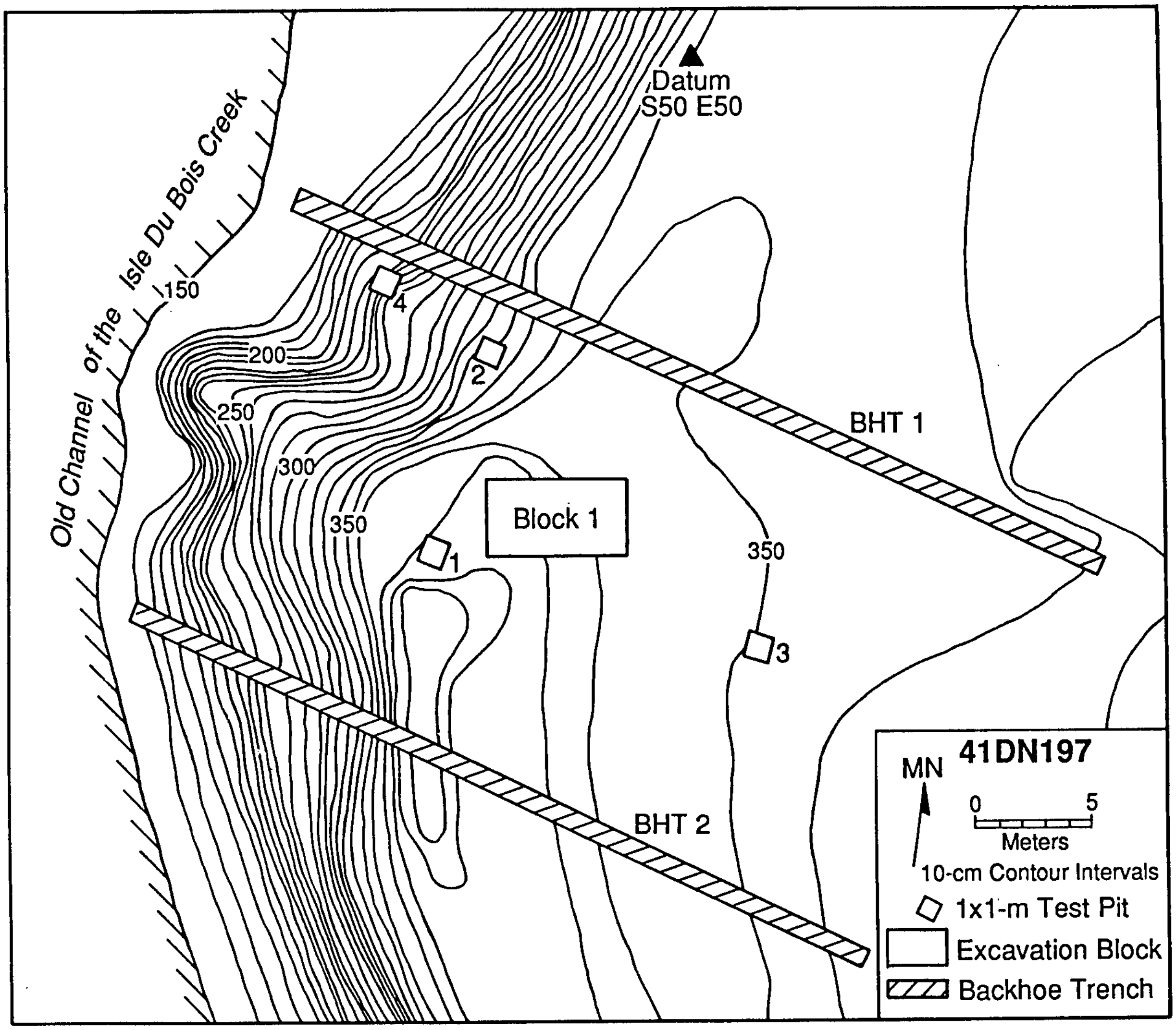


Figure 11.1 Map of the Britt Site showing excavation areas.

as the Merrill Site and the Bobby D site, on Isle du Bois and the Elm Fork Trinity, respectively. At the Britt site, the buried soil parent material includes the sediments that contain the main archaeological horizon at the site. This horizon was midden-like in character, with a black clayey matrix, and common burned rocks and artifacts. This geologic context appears to have been comparable to that of the similarly dated occupations in Blocks 1 and 2 at the Bobby D Site (41CO141).

Here, as at the Merrill Site (41DN99) alluviation continued after archaeological occupations. Then a period of relative floodplain stability followed, and more recently the site was buried by levee deposits. The levee deposits appear to reflect a shift in channel location rather than any environmental change.

Geochronology

A single radiocarbon age of 1129 +/-70 years BP (Beta-32985) was obtained on charcoal from levels 22-23 in Block 1. This age is concordant with the stratigraphy of the site, and with the small assemblage of artifacts recovered. The archaeological materials recovered suggest that the main occupation dates to the early

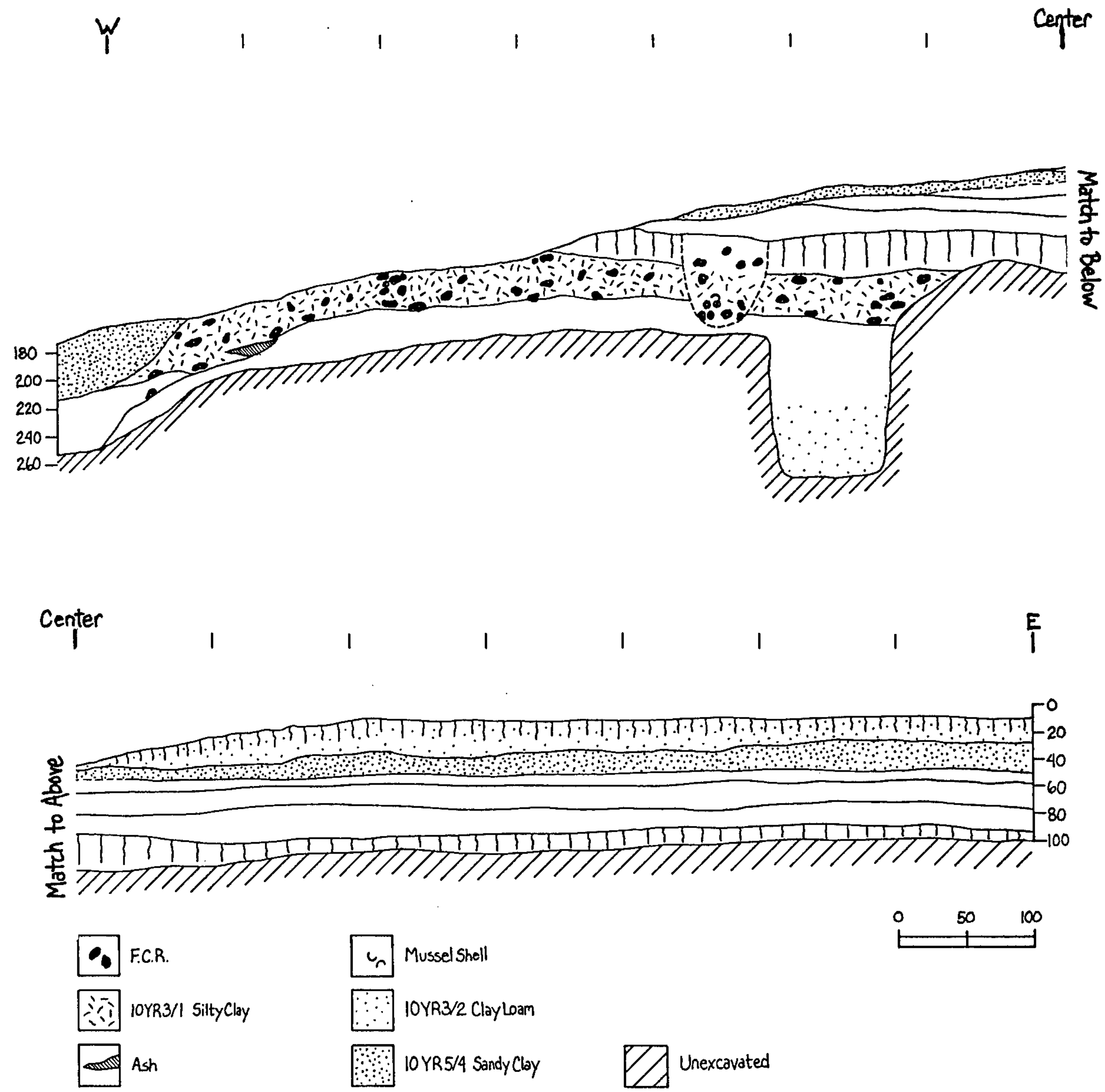


Figure 11.2 Profile of Backhoe Trench 2, the Britt Site.

part of the Late Prehistoric period. One Late Archaic Trinity point was recovered from a backhoe trench. Late Archaic components may be present at the site, but were not defined during these investigations.

Archaeological Contexts

While detailed geologic studies were not conducted, this site appears to have formed in an aggrading floodplain environment that was conducive to burial and preservation of archaeological materials. The calcareous clay matrix for the main occupation horizons led to good preservation of bone and shell. This was further enhanced by levee deposition.

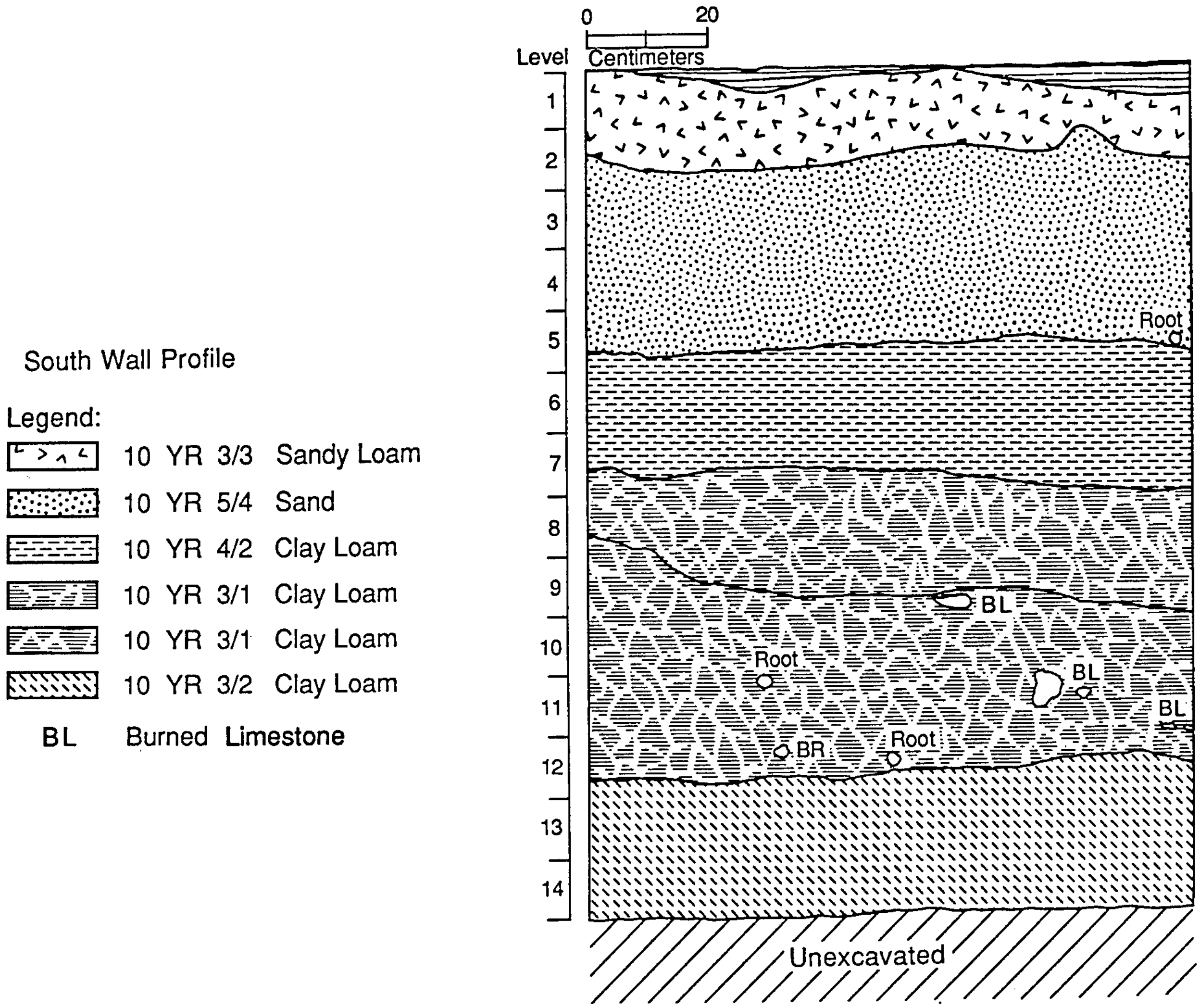


Figure 11.3 Profile of Test Pit 1, The Britt Site.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Strategy

A 3x6 m excavation block was established between Test Pits 1, 2, and 3 (Figure 11.1). The culturally sterile overlying 40 to 50cm thick deposits were removed with a backhoe. To prevent crowding of personnel within the block, 8 noncontiguous units were begun first. Between 1-4 levels from these squares had been excavated when, in late May 1987, a large flood permanently inundated the site (the Ray Roberts Dam gates were by that time closed). As a consequence, only limited data from this site were recovered. The remaining effort budgeted for this site was shifted to the Pond Creek Site (41DN103), where a small excavation was completed.

Features

Two features were found, both during the testing phase. Feature 1 was located in Test Unit 1; it was first detected in level 10 (90cm below the surface). The feature was a hearth, and contained a concentration of burned rocks, flakes, bone, and two Scallorn projectile points. Small quantities of charcoal occurred in levels 11 and 12. Beginning in level 13, artifact frequencies decreased indicating Feature 1 had a depth of approximately 20 cm.

Feature 2 was a burial, located in Test Unit 2. It originated in level 8 (73 cm bs) and continued through level 10. The feature consisted of a flexed burial of a small child within a prepared oval-shaped pit. The pit measured 25x45 cm in diameter. Analysis of the human osteological remains are presented in Appendix A.

Although features had not been designated in the excavation block when work terminated, it is clear that the block was exposing a midden-like deposit with abundant burned rock and moderate amounts of burned bone. Indeed, the few squares that were excavated in level 24 yielded the highest density of burned rock of any site in Ray Roberts (Table 11.2), comparable to the central parts of burned rock features found at sites such as 41CO150 or 41DN346. It is unfortunate that these occupation horizons could not be investigated more completely.

Artifact Assemblages

Only a small sample of artifacts was recovered because of the premature flooding of the site (Table 11.1). The assemblage is limited to lithic artifacts, half of which were found during the testing phase of excavations. Although the sample is small, the limited excavation data suggested that moderately high densities of lithic artifacts and bones were present in the main occupation horizons explored (Table 11.2). Levels 23 and 24 also had very high densities of burned rock. Burned bone was highest in level 24, corresponding with the higher concentration of burned rock. This pattern is similar to that at the Bobby D site, although the Britt site has very little mussel shell by comparison.

Table 11.1 ASSEMBLAGE COMPOSITION, DN197

Level	DEB	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
21	8				8
22	28		1	1	30
23	50	2		1	53
24	22	1		2	25
Tests	107	2	1	3	113
TOTAL	215	5	2	7	229
PCT	93.89	2.18	0.87	3.06	

The debitage samples from the excavation block show an upward increase in chert, cortical pieces and large pieces (Table 11.3) although the samples are small. When test data are considered as part of the whole assemblage, lower chert frequencies are indicated.

The tool sample is dominated by arrow points (Table 11.4). Other than two fragments, all the arrow points are Scallorn. These include two typical Scallorns and two that are serrated; only one is made of Ogallala quartzite. The Trinity dart point is atypical, and was found in backhoe trench spoil, and a Marshall-like point fragment was been reworked with steep retouch. Both of these dart points were made of regional tan chert, as is the single retouched piece. The three blank-preforms are of arrow point size.

Table 11.2 ARTIFACT DENSITIES, SITE DN197

level	% burned	debden (n/m3)	artden (n/m3)	boneden (n/m3)	mussden (gm/m3)	rockden (gm/m3)
21	4.21	10.00	10.00	158.33	0.00	193.30
22	16.2	40.00	42.86	202.86	0.00	3871.40
23	16.16	76.67	81.67	546.67	32.00	19116.70
24	48.15	73.33	83.33	270.00	56.67	43940.00
Mean	21.18	50.00	54.47	294.47	22.17	16780.35
Std Dev	16.32	27.18	30.35	150.94	23.82	17211.02

Table 11.3 DEBITAGE, SITE DN197

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
21	0	0	4	2	0	0	0	0	6	0.00	33.33	100.00
22	0	0	6	10	4	0	2	6	28	42.86	57.14	85.71
23	14	2	14	10	4	0	2	0	46	13.04	26.09	56.52
24	12	2	4	2	2	0	0	0	22	9.09	18.18	27.27
Tests	54	19	13	10	0	1	1	1	99	3.03	31.31	25.25

In sum, the lithic assemblage from the Britt site is dominated by projectile points. Conclusions concerning raw material acquisition and processing are limited owing to small samples, but overall, the assemblage appears comparable to that from 41CO141. This appears to reflect a site used repeatedly by groups during the early part of the Late Prehistoric period. No ceramics and no groundstone were found. Limited on-site knapping appears to have been focused on biface manufacture, using small flake blanks.

ZOOARCHAEOLOGY

Only 89 identified elements were recorded from 41DN197 out of a total of 809 bones recovered. The taxa list (Table 11.5) contains 14 entries, representing reptiles, birds, and mammals. In this sample, 52% of the identified elements are assigned to deer, and turtle shell is a very minor component. The remainder of the identified fraction is composed of rabbits, squirrel, cotton rat, turkey, and a smaller bird all recovered from levels 21-24; from test units and backhoe trenches, beaver, raccoon, and box turtle were added.

Table 11.4 ARTIFACT TYPOLOGY, SITE 41DN197
(x/x = chert/quartzite)

CLASS/Type	LEVEL 22	LEVEL 23	LEVEL 24	Tests
POINTS				
Arrow Points				
Scallorn		-/1		-/1
Scallorn, serr.	1/-			-/1
Indet., serr.			1/1	
Dart Points				
Trinity				1/-
Marshall, rewk.	1/-			
UNIFACIAL TOOLS				
Alternate ret. flk.				1/-
BLANKS				
Blank-preform			1/-	-/2
Biface fragment		1/1		
TOTAL	2	3	3	6

Table 11.5 Summary of Faunal Remains, 41DN197

Taxa	LEVEL 21	22	23	24	BHT
Box Turtle					6
Indet. Turtle		2		7	4
Turkey				2	2
Indet. Bird, med			2		
Indet. Bird, lg		1			
Cottontail		1	2	4	1
Swamp/Jack Rabbit		1			
Beaver					1
Tree Squirrel			1	1	
Cotton Rat			1		
Raccoon					1
Deer	1	3	17	9	16
Indet. Mammal, med					1
Indet. Mammal, lg				1	2
Unidentified	94	135	305	57	100

Burned bone accounted for 13% of the total bone recovered. Level 24 had the highest proportion of burned bones (27% of the bones in that level). Only 19 of the identified elements showed evidence of burning. Burned elements were identified for turtle, rabbit, deer, medium and large mammal; they were found evenly distributed within the block and among the test pits and trenches. No pattern was apparent.

Two pieces of worked bone were cataloged. One was a modified metatarsal splinter fragment, shaped into and awl or pin; it was found in Test Unit 1 at 120 cm below surface. The other was an ulna awl fragment from excavation Unit 3 at level 22. A burned antler tine fragment from level 23 may have been utilized. Cut marks were recorded on one deer metacarpal shaft, indicative of skinning cuts.

The 30 deer elements at this site are primarily meaty elements from the fore- and hindquarters. Teeth are present, which usually indicates that the carcass was butchered on site, but in this case, all of the phalanges are missing as well as the axial skeleton, suggesting that the head and legs were all that were brought to the site for consumption. One rib fragment was recovered, but no other elements from the rib cage and backbone or pelvis were identified. While some parts of the vertebrae and pelvis are not durable, the acetabulum, pubis, and certainly the phalanges would have survived. Their absence may then indicate a factor of procurement distance, or their area of disposal was simply missed by the excavation plan.

Although it is a small sample, the deer bone exhibits a different taphonomic complex from that seen at most of the other sites. The bone is in good condition, without traces of exfoliation or gnawing. A few elements show longitudinal and mosaic cracking (Behrensmeyer's [1984] Stages 1 and 2), some root etching and staining, and trampling. These taphonomic indicators suggest that the bone laid on the surface exposed to severe weathering agents for a very short time, if deposited in the warm season, or longer if deposited when colder. Unfortunately, no reliable seasonality indicators are available.

SUMMARY

The limited investigations at the Britt site were able to minimally document the evidence for occupations that date to the early part of the Late Prehistoric period. The lithic assemblage and the radiocarbon age allow correlation with the Late Prehistoric occupations at the Bobby D Site (41CO141). The latter differs from the Britt site in that a few Gary Points were recovered, yet neither site had any ceramics. Subsistence data suggest foraging patterns similar to those at 41CO141, although mussel collection was more important at 41CO141. The sandy bottom of Isle du Bois Creek probably supported few mussel species, but the Britt site is close enough to the Elm Fork to have facilitated collection there.

It is unfortunate that more extensive excavations could not have been completed at the Britt Site, since the limited work suggests the presence of a substantial midden deposit. This may signify an occupation pattern at least as intensive as that at the Bobby D Site. The small sample of tools recovered prohibits much in the way of functional consideration of the Britt Site occupations, although what data that are present suggest limited activities beyond those associated with hunting and on-site processing. As for the Bobby D Site, the absence of ceramics is suggestive of intermittent occupations not associated with a hamlet. Geologically, this site is more similar to sites on the Elm Fork Trinity, with calcareous clay matrix and moderately deep burial of the occupation horizons. This contrasts with the sandier sites upstream on Isle du Bois Creek, such as the Merrill and the Randy site, where sandy matrix promoted different site formation processes. Burial beneath sterile levee deposits that concealed the in situ materials initially led to negative recommendations for the Britt Site. Here, as at other Ray Roberts sites, natural levees appear to offer prospects for well preserved albeit concealed late Holocene archaeological contexts of site formation.

CHAPTER 12
THE POND CREEK SITE (41DN103)

INTRODUCTION

Previous Investigations

The Pond Creek Site was recorded and surface collected in 1980 by ECI (Skinner et al. 1982a). ECI testing in 1981 consisted of 10 auger holes and three 1x1m test pits. A rock-lined hearth was found ca. 50 cm bs in one of the test pits, and in situ deposits of lithic artifacts, bone and shell were defined over the site area. Subsequent investigations by ECI (Skinner et al. 1982b) consisted of 15 shovel tests, three backhoe trenches excavated perpendicular to Pond Creek and seven 1x1m test pits. This phase resulted in recovery of additional artifact and ecofact samples, and one radiocarbon age (see below). The archaeological materials were found in floodplain alluvium, buried below a natural levee. Following this work by ECI, and prior to investigations by UNT, the levee deposits and some of the floodplain deposits were disturbed and/or removed by clearing contractors.

SITE SETTING AND GEOLOGY

The site is situated at the edge of the Pond Creek floodplain, overlooking the present channel of that stream (Figure 12.1). It is possible that during the occupations of the site that the channel below the site was the Elm Fork Trinity, and proximity of the Elm Fork channel indicates that the aggradation history of the site area was controlled by that stream.

Detailed geologic study of this site was not conducted. The sediments in Block 1 were however floodplain clays and silts that originally had been buried by coarser levee deposits. A buried soil that contained the majority of the archaeological materials sloped off the main site area towards the Pond Creek channel (Figure 12.2). This was informally designated as the "midden". These deposits were buried by a drape of flood deposited silty loams and in part by construction-related spoil. Given evidence from other localities that Late Holocene channels were about as deep as present channels, it is probable that the topography of the site was similar during the occupations. Thus the "midden" deposits may have accumulated below the site during occupations, and were subsequently buried by the flood drapes. The steep slope of the sediments with prehistoric artifacts and debris may help explain the radiocarbon age determined on a "hearth" by ECI. The age of 682 +/- 150 BP (Beta-5680) appears to be too young. Yet the dip of the cultural deposits coupled with the large error associated with the radiocarbon age indicate that it could be associated with the younger cultural deposits at the site. This problem cannot be resolved now however.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Strategy

UNT relocated the site in 1985 and a diffuse surface scatter of lithic debris and burned rock was noted. Three shovel tests were excavated in areas with the densest surface concentration of artifacts. Shovel Test 1 yielded a fragment of mussel shell while the other two did not yield archaeological materials. Site 41DN103 was put on an alternate list of sites to be excavated by UNT. However, because of the premature inundation of site 41DN197, which was a primary site for excavation, site 41DN103 was chosen for a shift in effort.

The excavations were undertaken in 1987 after the site area had been cleared of vegetation by clearing contractors. These investigations (Figure 12.1) consisted of three backhoe trenches excavated perpendicular to the channel of Pond Creek and one block of contiguous 1x1m squares. Backhoe Trench 1, the middle trench, exposed an area that had well-preserved subsurface cultural remains. Block 1, initially measuring 3x4m, was placed adjacent to and west of Backhoe Trench 1 in the area of buried cultural remains. This block was expanded into a 5x6m block with two additional 1x1m units extending north that resulted in a total of 32

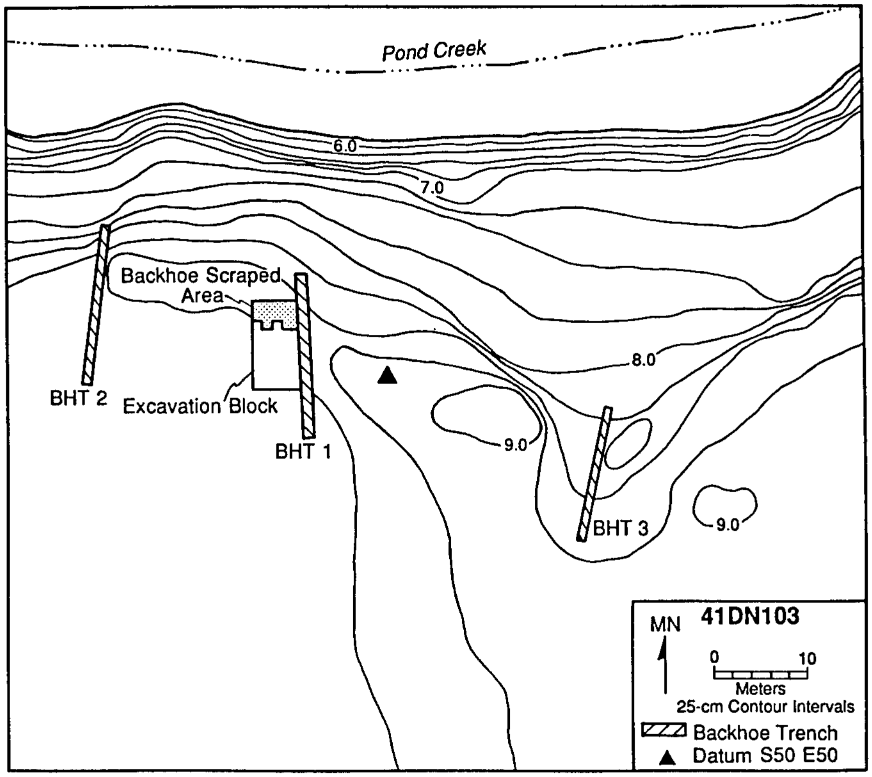


Figure 12.1 Map of the Pond Creek Site (DN103) showing excavation areas.

contiguous 1x1m units. The original 3x4m block was used as a demonstration excavation for a public open house that was part of the UNT-USACE contract. Two rock hearths were found during excavation. Lithic artifacts, mussel shell, vertebrate faunal remains, and burned rock were recovered.

Features and Spatial Patterning

Feature 1, a rock-lined hearth with associated debitage, bone, mussel shell, and lithic tools was first recognized in level 4 and continued into level 5. It measured 70x100 cm with a depth of 9 cm.

Feature 2, another rock-lined hearth, was found in level 6 and continued into level 7. No charcoal was associated with it. The feature measured approximately 65x40 cm in diameter with a depth of 21 cm. It was noted that the concentrations of burned rock dip towards Pond Creek following the natural stratigraphy (Figure 12.2); this paleosurface could not be detected easily using sediment color alone, but burned rock and chipped stone artifact concentrations dip in that direction. The truncated distributions of artifacts and burned rocks in the northern part of the excavation block is a manifestation of the dipping stratigraphy (Figures 12.3-12.6). This can also be seen in the regular upward decrease in densities of debitage, mussel shell, burned rock and bone (Table 12.2). Because perishable and lithic materials follow the same density pattern, it is less likely that differential preservation is the main factor responsible for the pattern. On the other hand, it is clear that the percentage of burned bone declines upward with declining bone densities. This may have a basis in patterns of occupation and/or bone processing, as discussed below.

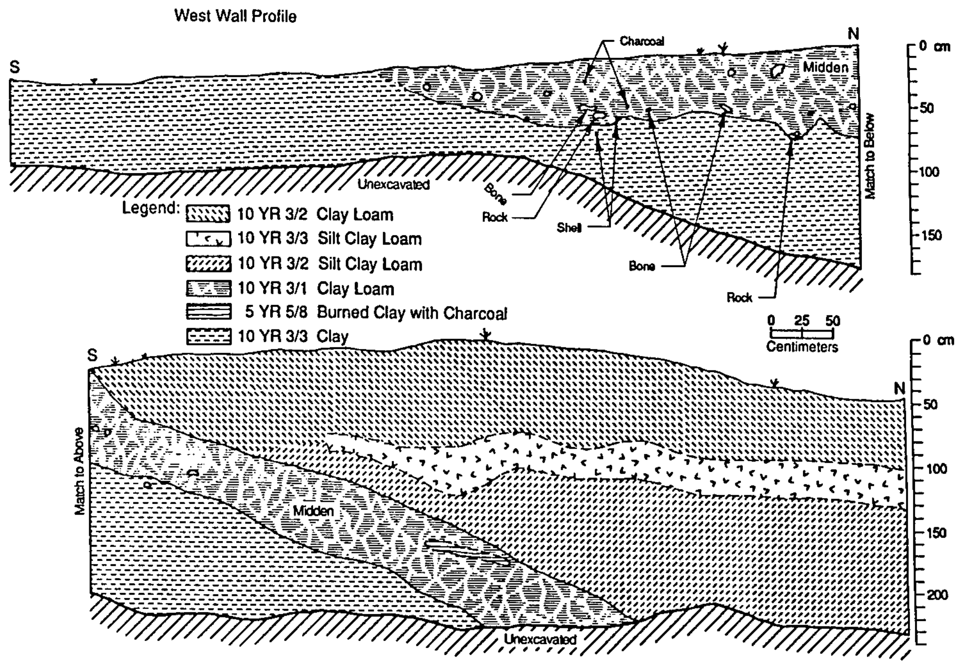


Figure 12.2 Profile of west wall, Block 1, at DN103.

Artifact Assemblages

The sample of artifacts from the Pond Creek Site is quite large given the small block size (Table 12.1). This is because artifact densities are relatively high in levels 4-6 (Table 12.2). Technological data suggest that on-site biface reduction probably contributed to the higher artifact densities. Moderate amounts of cortical debitage was recovered; these pieces have their highest frequency in level 4, with fewer cortical pieces above and below that (Table 12.3). Large debitage is more common for both chert and quartzite raw material categories. Although only one core was recovered, each level had at least one blank-preform (Table 12.4). All of these are made of quartzite except the one from level 2, which is on regional chert.

The dominance of bifaces in the assemblage is clear, as only one unifacial tool was recovered (Table 12.4). Although about half of the arrow points are fragmentary, the identifiable types are either Scallorn or Bonham (Table 12.5; Figure 12.7). All of the identifiable dart points are Gary forms. Those from the lower levels vary considerably in morphology, and about half are made of chert. By contrast only one arrow point is made of regional chert. This projectile point assemblage is very similar to that at the Bobby D site (41CO141). The association of Gary dart points and a variety of arrow points at these two sites strengthens the conclusion that they are contemporary assemblage components. The homogeneous Gary dart point assemblages contrast with Late Archaic assemblages from Ray Roberts, which exhibit a quite different range of dart point types.

With respect to on-site processing and use of lithic materials, this assemblage appears to reflect an emphasis on biface manufacture and use. The absence of groundstone and the paucity of unifacial tools suggests limited functional variation among probable repeated occupations. This also could be taken as evidence for light use of debitage for expediency tools and little re-use of specific unifacial tool blanks owing to the higher concentration of debitage (ie., available unifacial tool blanks).

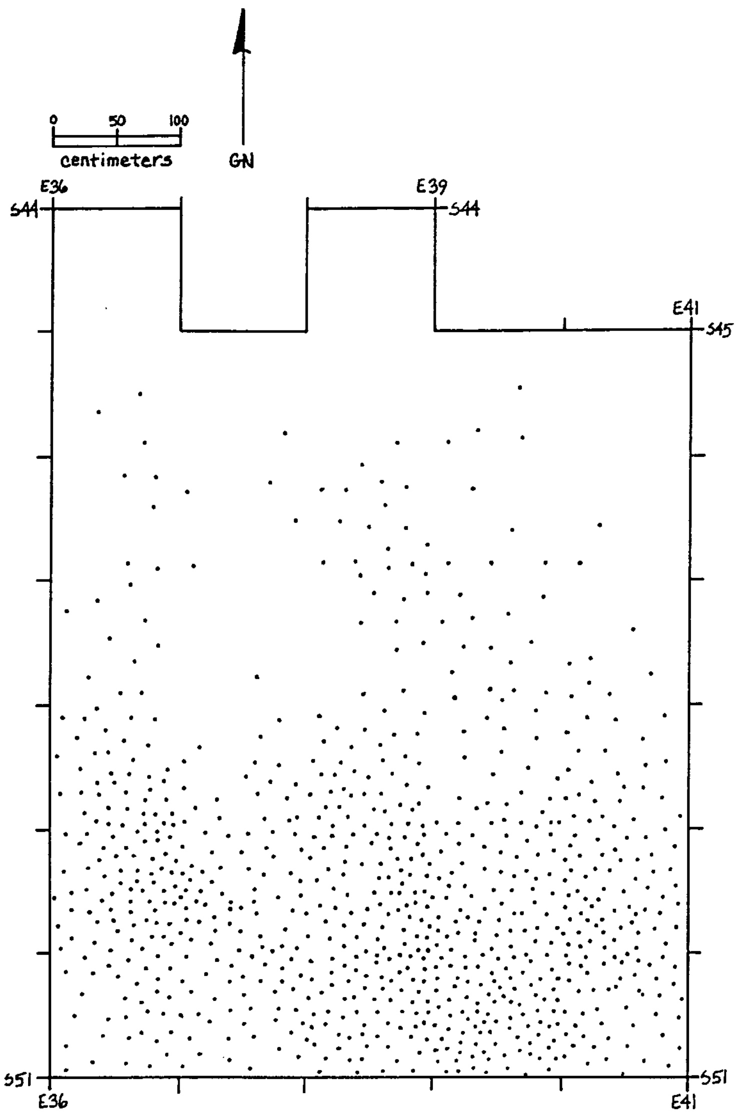


Figure 12.4 Plan of debitage distributions, DN103 levels 4,5.

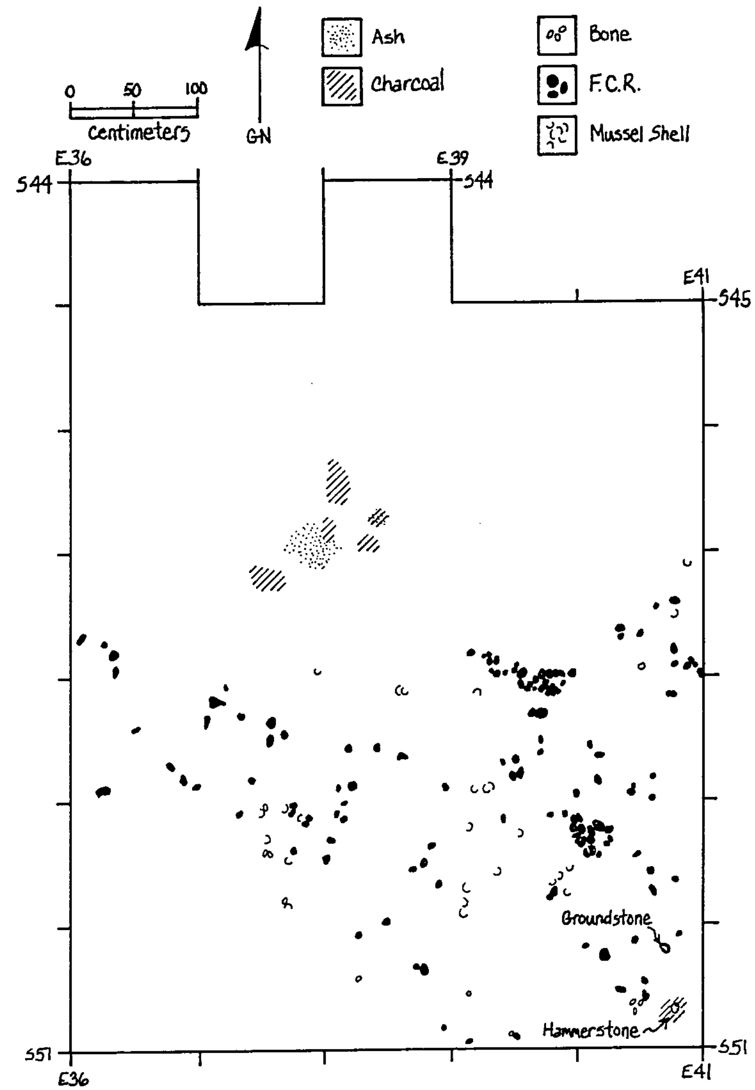


Figure 12.3 Plan of features and burned rock, DN103, levels 4,5.

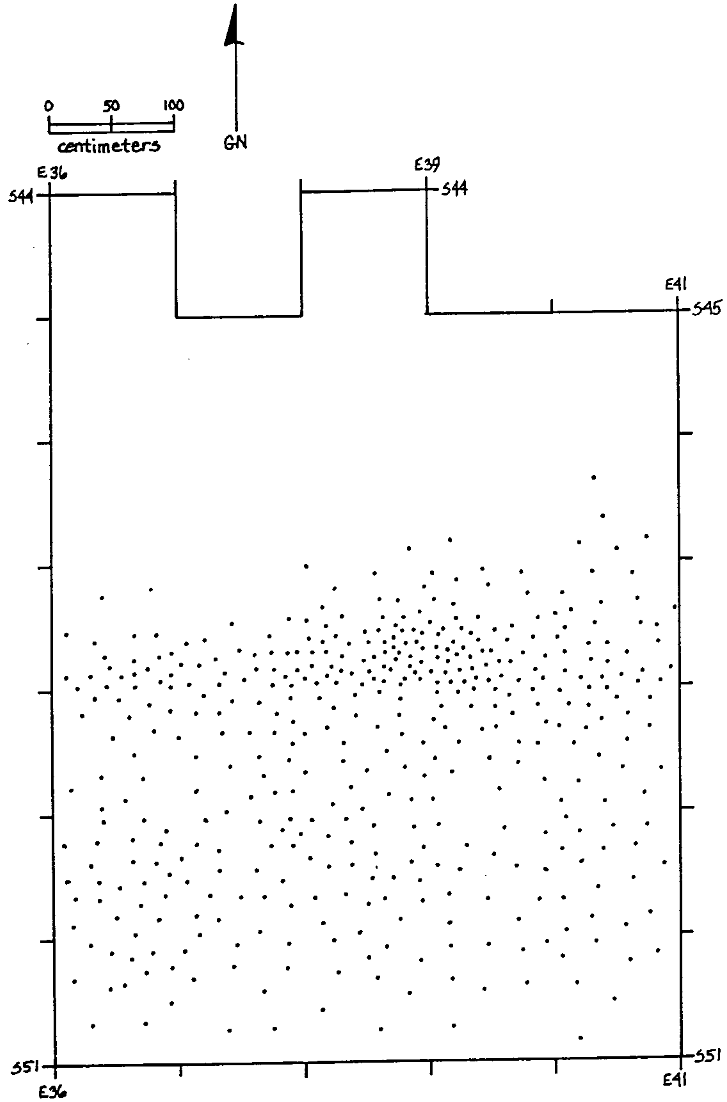


Figure 12.6 Plan of debitage distribution, DN103, levels 6,7.

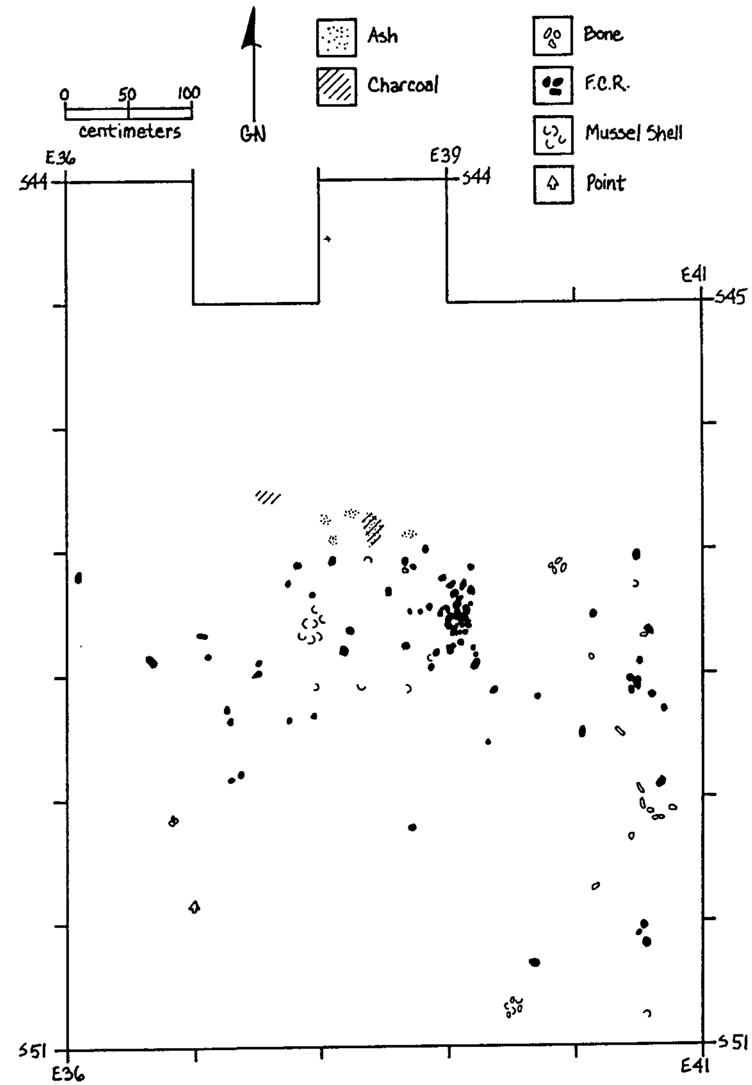


Figure 12.5 Plan of features and burned rock, DN103, levels 6,7.

Table 12.1 ASSEMBLAGE COMPOSITION, DN103

Level	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
2	40			1		41
3	91			5	4	100
4	379		3	1	4	387
5	438	1	1	7	2	449
6	326	1		4	2	333
7	113		2	1	3	119
TOTAL	1387	2	6	19	15	1429
%	97.06	0.14	0.42	1.33	1.05	

Table 12.2 ARTIFACT DENSITIES, 41DN103

level	debden (n/m3)	artden (N/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned
2	12.67	13.00	27.67	91.33	47.67	22.38
3	29.33	32.00	71.00	295.33	82.33	28.34
4	112.67	115.33	211.33	1252.67	162.33	39.22
5	134.67	138.33	238.33	4348.67	186.00	43.55
6	126.40	129.20	331.20	7780.00	195.60	45.19
7	38.00	40.40	38.00	3854.80	59.60	38.93
Mean	75.62	78.04	152.92	2937.13	122.26	36.27
Std Dev	49.93	50.68	114.09	2714.25	60.73	8.21

Table 12.3 DEBITAGE, DN 103

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
Level	INT	CTX	INT	CTX	INT	CTX	INT	CTX	TOTAL	Chert %	Cortex %	Large %
2	15	1	12	3	2		3	2	38	18.42	15.79	52.63
3	21	2	33	11	6	2	13	3	91	26.37	19.78	65.93
4	99	16	116	50	16	5	20	16	338	16.86	25.74	59.76
5	115	11	146	67	23	1	28	13	404	16.09	22.77	62.87
6	109		120	45	13		24	5	316	13.29	15.82	61.39
7	23	2	51	8	4		7		95	11.58	10.53	69.47

Table 12.4 ARTIFACT TYPOLOGY- DN103, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	LEVEL 2	3	4	5	6	7
BIFACES						
Arrow point		1/3	-/3	-/2		
Dart point		-/1	-/1	1/1	1/2	2/1
UNIFACES						
Retouch, bilateral				1/-		
BLANKS						
Blank-preform	1/-	-/1	-/3	-/3	-/1	-/2
Biface fragment				-/2		
CORES						
Single plat. flake				-/1		
Total	1	6	7	11	4	5
% Chert	100	17	0	18	25	40

Table 12.5 PROJECTILE POINT TYPOLOGY- DN103, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	LEVEL 3	4	5	6	7
ARROWPOINTS					
Bonham	1/1*	-/1			
Scallorn	-/1	-/1			
Indeterminate	-/1	-/1	-/1		
", serrated			-/1		
DART POINTS					
Gary	-/1	-/1	1/1	1/2	1/1
Indeterminate					1/-
Total	5	4	4	3	3
% Chert	20	0	25	33	67

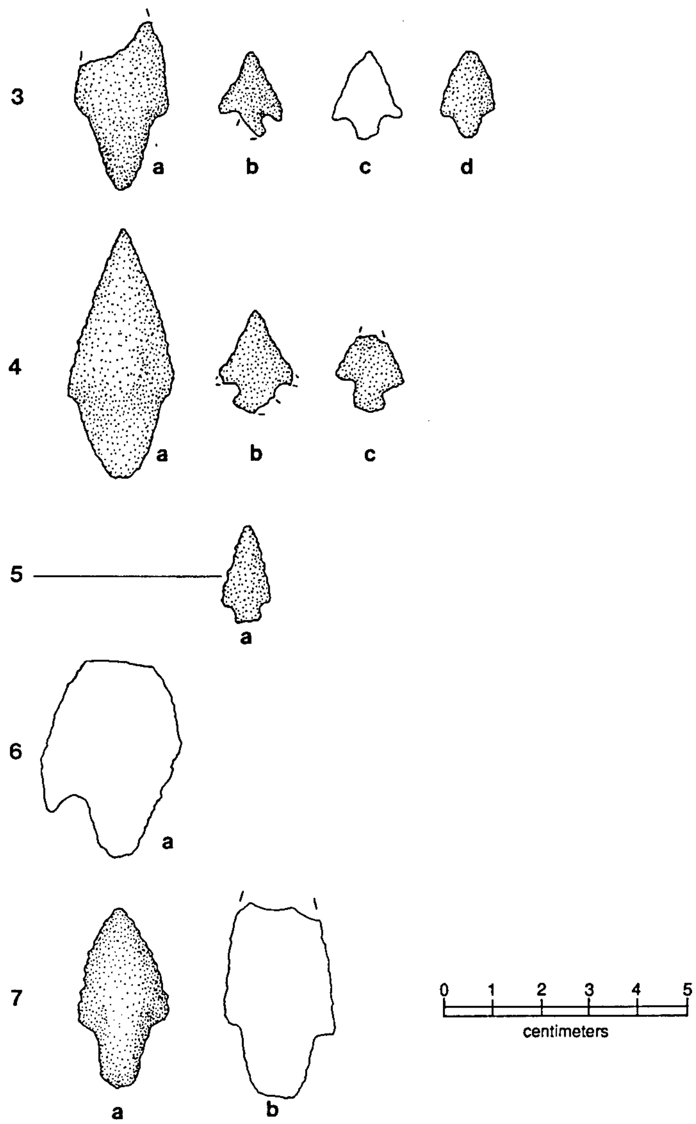


Figure 12.7 Projectile Points, Site DN103.

ZOOARCHAEOLOGY

Previous work by Skinner and Baird (1985) recovered a meager amount of deer and turtle remains from 41DN103 in their 1982 season. Yates (1985) reported a poorly preserved deer antler with skull fragment attached, and from the development of the burr and pedicle, assigned a fall season of procurement. Approximately 20% of the bones were burned in that sample.

Likewise, the present study at this site produced a modest sample of animal bone (N=2,500). As before, burned bone accounts for about 24% of the total recovery, but the identified fraction (30%) is higher than that previously recovered and consists of 31 taxonomic categories (Tables 12.6, 12.7). A larger excavation plan resulted in substantial sample sizes, which in turn account for the enhanced taxa list.

Table 12.6 Summary of Faunal Remains, 41DN103

Level	Total Bone	#ID	#Burned
1	1	1	0
2	143	34	20
3	247	50	21
4	605	147	173
5	595	198	139
6	612	210	180
7	198	72	53

Levels 4, 5, and 6 contained the greatest amounts of faunal materials (Figure 12.8), averaging 16 taxonomic categories for the identified fraction. A noteworthy assortment of taxa occurs in these levels. For example, aquatic species such as fish, frog, snapping turtle, soft-shell turtle, and beaver were found exclusively in this zone. The beaver can be linked with other medium-sized furbearers that were found only in these levels such as badger and raccoon. Jackrabbit occurs in level 4 and 7 to the exclusion of cottontail, for which only a single element was recovered in the entire site and that from level 2. Minimal fine-screening and flotation produced the few rodents, snake, and bird elements, mostly from levels 6 and 7 (from three control columns in Block 1).

Two large grassland species, pronghorn and bison, are represented in the assemblage, but as usual for this study area, few diagnostic elements were identified, and therefore their importance to the subsistence regime of the site's occupants is indefinite. Pronghorn, for instance, is present in level 5, but only from four tooth enamel fragments from the same locus, representing probably one broken, isolated tooth. Similarly, a large piece of bovid enamel from level 3 is tentatively identified as bison, and a complete metacarpal that was diagnostic for bison was recovered from Backhoe Trench 1. The relationship of the metacarpal to the occupation at this site was not established. Both of these elements attributed to bison may be nothing more than fortuitous finds mixed in with the archaeology of the site.

At least three deer are estimated from levels 4-7. This estimate is based on three left petrous processes (ear area). More significantly, there are three individuals of different ages: two dental ages of around 5 and greater than 7 years at death, and one neonatal radius. Because none of the petrous processes were from a neonate, the estimated MNI can be increased to four deer.

From this age assessment, some indication of selectivity and seasonality is possible as well. For example, the hunters appear not to be selecting for exclusively old or young animals because at least one deer was prime. The presence of a neonate (less than 2 months) suggests a late spring or summer kill because Texas deer tend to have their fawns during these months.

As found in other Late Prehistoric components at nearby sites of 41CO141 and 41DN197, deer carcasses were butchered on site, leaving comparable percentages of carcass parts in the archaeological record. These typically consist of high residues of lower leg bones (metapodials, carpals, tarsals, and phalanges), many highly resistant cranial and dental elements, and a few recognizable limb and axial elements (Figure 12.9).

Only one bone exhibits a cut mark, however, and this is a deer cranial fragment with a deep cut, perhaps resulting from antler removal. Few of the limb bone displayed spiral fractures, but this may be related to the extent of destruction caused by gnawing animals either during occupation or after abandonment. Fully

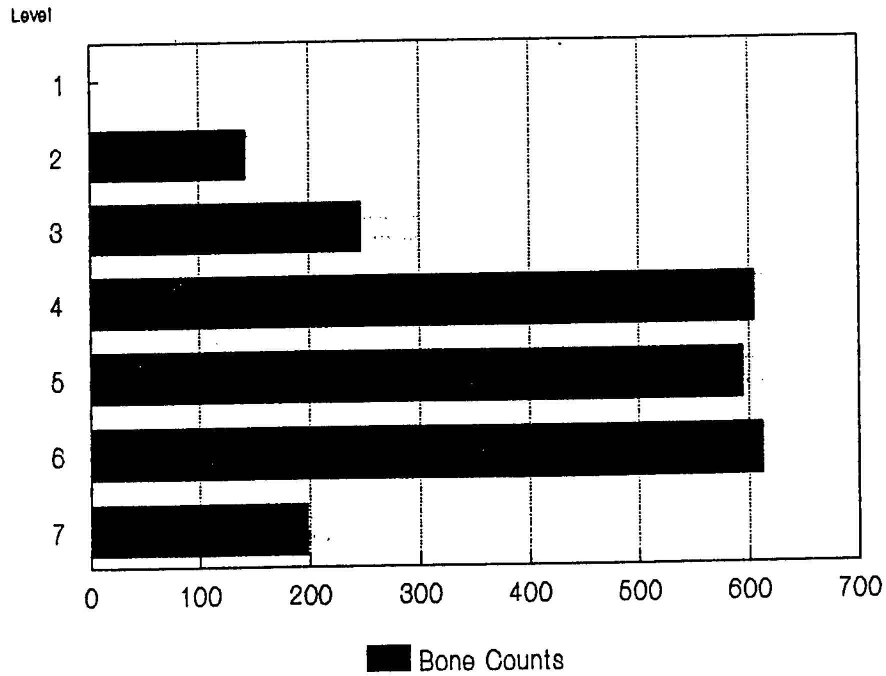


Figure 12.8 Total bone recovered per level, 41DN103.

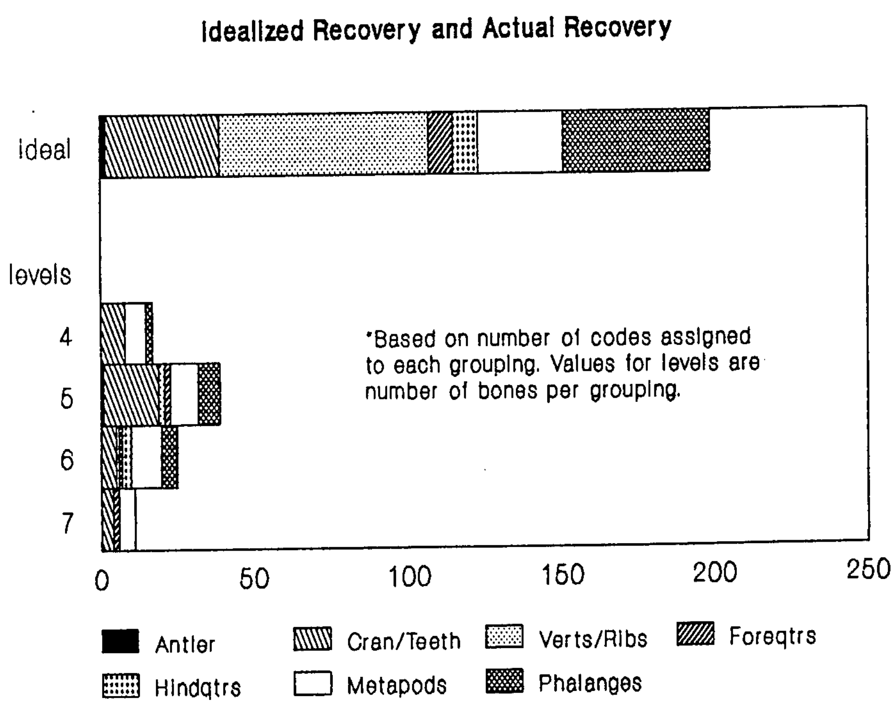


Figure 12.9 Vertical distribution of deer carcass parts, 41DN103.

Table 12.7 Identified Taxa, DN103

	LEVEL 1	2	3	4	5	6	7
Indet. Fish					1		
Toad/Frog						1	
Stinkpot Turtle							1
Musk/Mud Turtle			1	1	2	2	1
Snapping Turtle					1		
Soft-shell Turtle					1		
Slider					1		
Box Turtle		2	3	10	8	5	4
Indet. Turtle		24	38	98	123	136	61
Non-ven. Snake				1	4	1	1
Indet. Snake				3		4	
Indet. Bird, sm				1	1		
Indet. Bird, med						1	
Cottontail		1					
Jack Rabbit				1			1
Indet. Rabbit							1
Tree Squirrel							1
Beaver				1	1	4	
Pocket Gopher				5	2	12	
Woodrat						1	
Indet. Rodent				2	2	3	
Raccoon				1			
Badger					4	2	
Deer	1	2	2	7	9	4	2
Pronghorn					4		
Deer/Pronghorn		3	4	10	30	21	9
Bison			1				
Indet. Mammal, sm		1			4	1	
Indet. Mammal, med				2	1	2	1
Indet. Mammal, lg		1	2	4	3	10	1
NISP	1	34	51	147	202	210	84
# of Taxa	1	7	6	15	19	17	12

half of the identified faunal remains (50% of total ID and 49% of bone from levels 4-7) have been gnawed. Gnawed may so severely alter the surface of the bones that other evidence of modification is totally obscured. In addition, with this degree of alteration, it can be assumed that many of the original faunal remains have been removed entirely from the record. Interestingly, no bones exhibited the characteristic corrosion caused by digestion.

In summary, 41DN103 contained faunal evidence of exploitation of the entire catchment area available to the hunters: aquatic (fish, frog, water turtles, beaver); woodland (box turtle, squirrel, cottontail, raccoon, deer); and grassland (jackrabbit, badger, pronghorn, bison). Admittedly, several of these species are each represented by a single element, but their presence in an assemblage that has been extensively disturbed by bone-gnawing creatures is suggestive of at least occasional subsistence use.

Use of the site by the hunters during summer and fall can be deduced from the neonatal deer element and the previously recovered antler. A year-round occupation cannot be eliminated, however.

As has been repeatedly documented at other sites in the Ray Roberts area, as well as other river basins of North Texas (Yates in press), many varieties of turtles were collected by the occupants. Not only the easily procured terrestrial box turtle, but at least five different genera of aquatic turtles were identified in this assemblage. Almost half of the turtle remains had been burned, while only 26% of the deer elements showed burning. The importance of turtles as food sources and utility items (vessels) has been heretofore underestimated.

SUMMARY

Overall, the Pond Creek site appears to represent a site used repeatedly by groups in the early part of the Late Prehistoric period. The radiocarbon age of ca. 682 BP cannot be directly associated with these occupations, but with its large error, it may pertain to the latest occupation episodes. The small vertebrate fauna from the site is indicative of quite general procurement patterns, although the paucity of rabbits is remarkable compared to virtually all other sites at Ray Roberts. The quite high densities of burned rock compares to patterns at 41CO141 and 41DN197. No evidence of architecture was found, and no ceramics were recovered, diminishing the possibility that any structures were present or that prolonged occupations took place. Rather, this site appears to have been used serially by groups whose main focus was procurement and on-site preparation of game animals.

CHAPTER 13
THE MERRILL SITE (41DN99)

INTRODUCTION

The Merrill Site is located on the west bank of Isle du Bois Creek, where a narrow floodplain is set against a low Late Pleistocene terrace (Figure 13.1). The site was revealed as an artifact scatter on the terrace surface, and testing showed in situ material in Late Holocene alluvium below a natural levee under the adjacent floodplain. Mitigation efforts focused on the latter setting.

Previous Investigations

The site was recorded by ECI in 1980 and a surface collection was made (Skinner et al. 1982a). ECI's testing consisted of 16 auger holes of which nine yielded cultural material, and nine 1x1 m test pits. Archaeological materials were found in deeper contexts, to about 140 cm below surface, near the Isle du Bois Creek channel. Most cultural material recovered during testing consisted of lithic debitage; diagnostic projectile points indicated Late Archaic and Late Prehistoric occupations. Based on results of this testing, recommendations were made for further excavation.

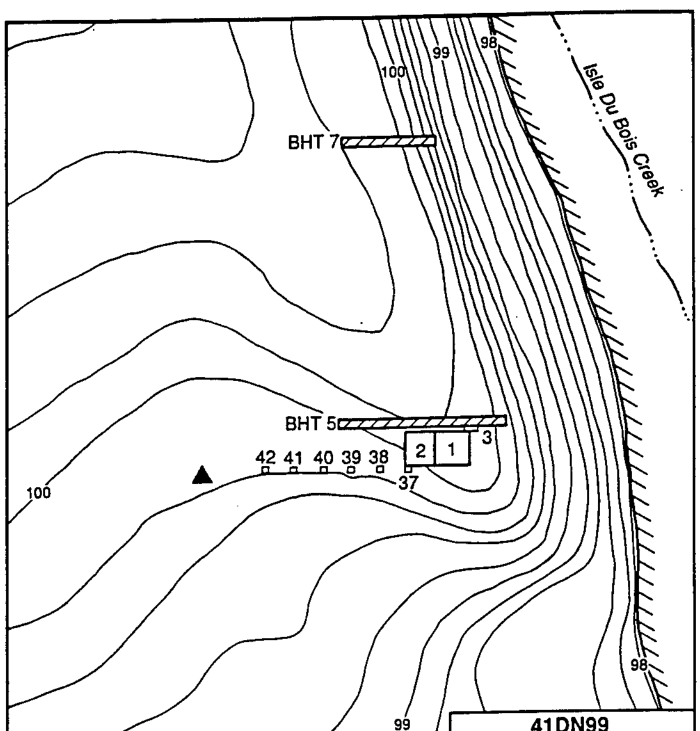


Figure 13.1 Map of the Merrill Site with excavation areas.

SITE SETTING AND GEOLOGY

Geomorphology

The Merrill Site area is dominated by a low late Pleistocene terrace of Isle du Bois Creek that extends to the west and above the area of excavations (Figure 13.1). The terrace is eroded, and slopes towards the creek and towards the reentrant south of the site area. North of the site there are deep alluvial deposits below the terrace surface, yet immediately west of the main site area, bedrock was exposed in trenches below a truncated B-horizon (Figure 13.2). Erosion of the terrace was probably enhanced by land clearing and plowing in the post-settlement period. Such activities may also have increased sediment delivery to Isle du Bois Creek and enhanced levee deposition. The natural levee in the site area is low, but along the creek it buried Late Holocene sediments that contain the major buried components at the site (Figure 13.2). Levee sands thin away from the creek, and were thicker in the site area prior to clearing of trees by contractors before the present archaeological investigations were begun.

Stratigraphy-Soils

The Holocene sediments at the site include sands that overlie the truncated soil that formed in late Pleistocene alluvium. Floods damaged the profiles in the area of block excavations, so a section exposing the buried Pleistocene soil was exposed about 20m north of the blocks (Figure 13.3; Table 13.1). The moderately developed soil has a red B-horizon and a thin A-horizon. The overlying levee sands have clay lamellae, indicating weak pedogenesis in the very sandy parent material. In this section, the sediments containing the major occupation horizons in Blocks 1-2 are very thin and are represented by the thin buried A-horizon.

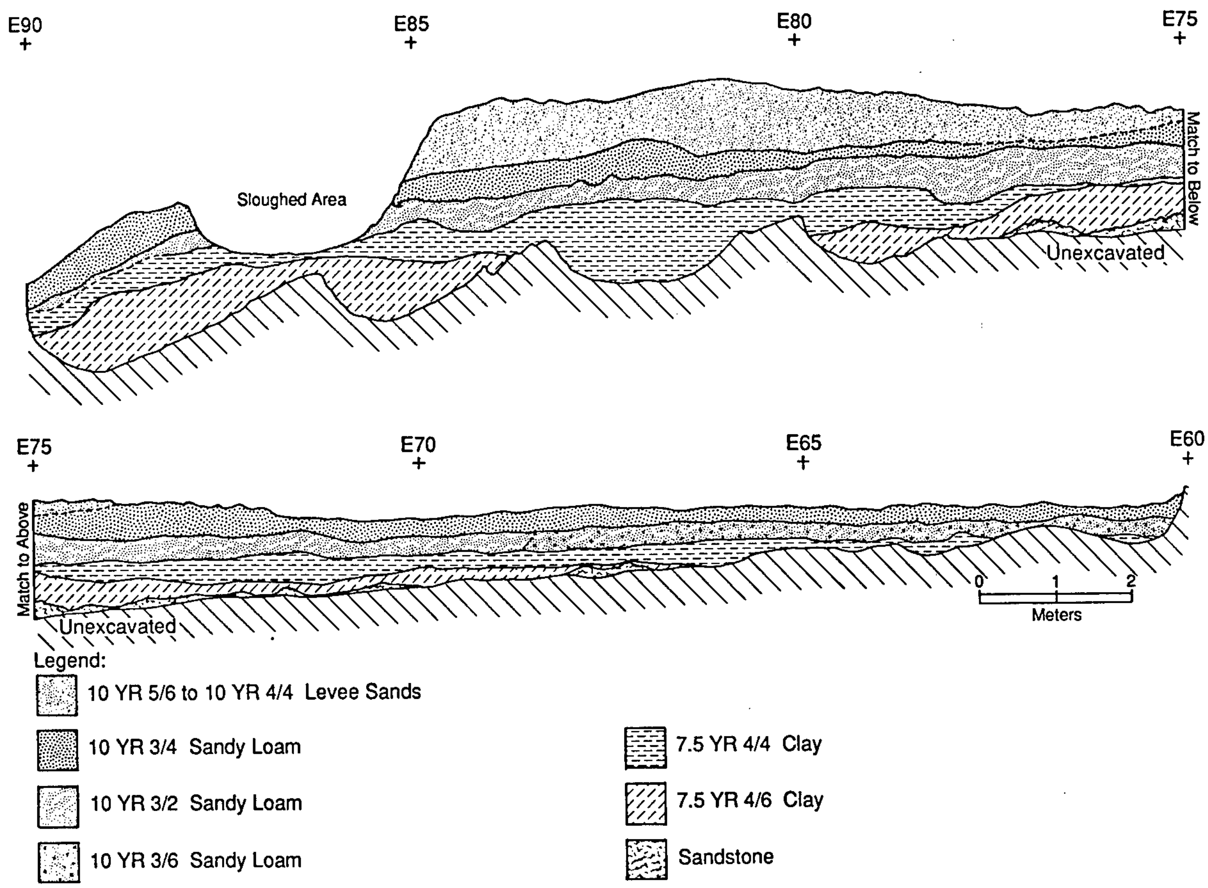


Figure 13.2 Cross section of Backhoe Trench 5, Merrill Site.

Table 13.1 Soil Profile Description
PROFILE DN99, Trench B

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY	
A	0-8	7.5YR3/4	fS	ms	n rctn	gs	
C	8-24	10YR4/4	fS	ms	n rctn	gs	
C2j	24-44	7.5YR4/4	f/mS	ms/lam	n rctn	gs	
C2j2	44-64	5YR4/4	mS	ms	n rctn	ai	
C3	64-77	5YR3/41	mS	ms	n rctn	ai	
2Ab	77-84	7.5YR3/3	fSL	wf sab	n rctn	cs	
2A2b	84-94	7.5YR3/4	fSL	mf sab	n rctn	cs	
2Btb	94-1129	6.75YR4/6	fSCL	mm sab	n rctn	gs	ff FeMn cc
2Bt2b	112-150	5YR4/63	fSCL	mm sab	n rctn	gs	ff FeMn cc
2Cb	150-192	5YR4/8	fSL	wm sab	n rctn	gs	
2C2b	192-250+	5YR4/8	fSL	ms	n rctn	base	ffm mott

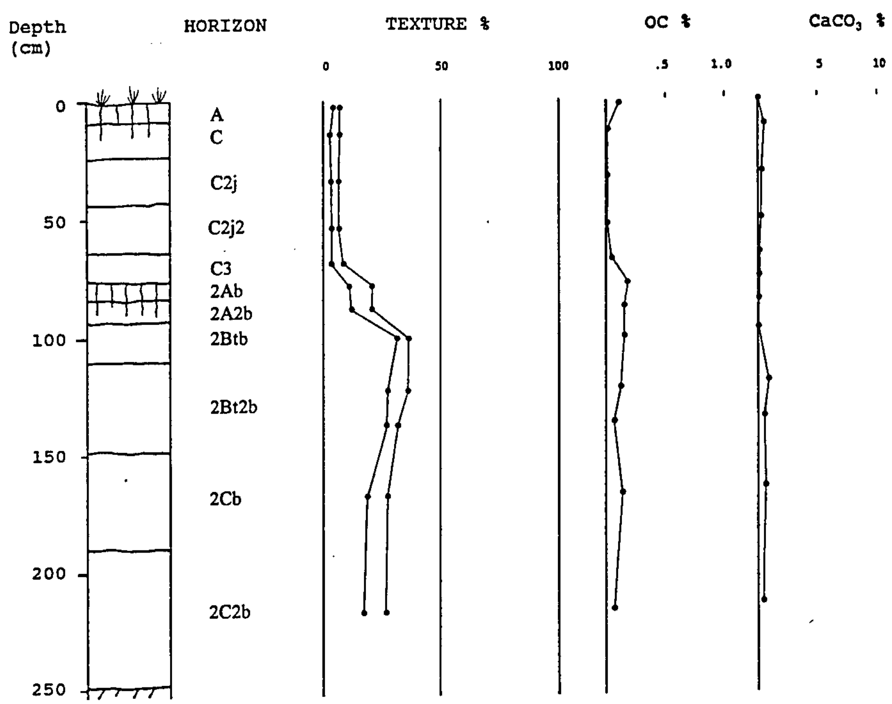


Figure 13.3 Profile of DN99, Trench B.

Table 13.2 Soil Profile Description
PROFILE DN99, BLOCK 2

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY
Truncated levee sands (0-15cm)						
2Ajb	15-30		LS	ms	n rctn	gs
2Aj2b	30-41		LS	ms	n rctn	cs
2ACb	41-70		S	ms/biot	n rctn	ci
2Cb2	70-124		S	ms/biot	n rctn	aw
3Btb	124-140+		SL			base

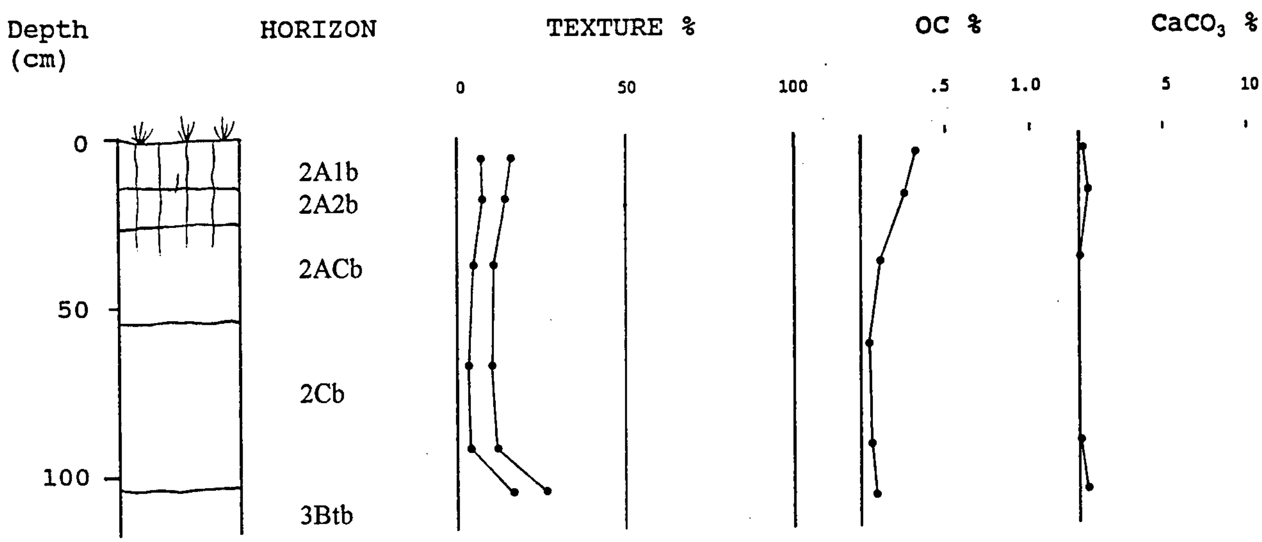


Figure 13.4 Profile of DN99, Block 2.

In the area of block excavations, a thicker deposit of floodplain sands is between the truncated B-horizon and the younger levee sands (Figures 13.2, 13.4). These deposits have slightly more clay and silt than the levee sands, and higher organic content. A cumulic to anthropic soil formed in these deposits, giving it a black color that decreased in chroma down through the section. This late Holocene soil is correlated with the West Fork Soil, that formed in Late Holocene time along the Upper Trinity River floodplain. Here, however, the soil formed in a context of repeated prehistoric occupations and in very sandy parent materials.

The sands containing the archaeological horizons were quite heavily bioturbated by plants, burrowing animals and by feature construction during prehistoric occupations. The fluvial sands are thicker towards the stream channel because of the dipping surface of the buried B-horizon and because of patterns of sedimentation from overbank flooding. Some colluvial deposition probably took place as well, although this is not as clear as at the Randy Site (41DN346). The sediments at the Merrill Site appear to have accumulated mainly as vertical accretion, a situation that is obviously more favorable to site formation. Nonetheless, this is clearly the "sandiest" site excavated at Ray Roberts. Block 1 was centered over the deeper section, while contiguous Block 2 was positioned where the fluvial sands thin to the west.

Geochronology

Three radiocarbon ages were obtained on charcoal from the alluvial sands below the levee sands in Block 1:

Level 2	528 +/-70 BP (Beta-32522)
Level 6	1,268 +/-70 BP (Beta-32523)
Level 10/11	1,406 +/-80 BP (Beta-32524)

The two younger ages appear to be reasonable, given the degree of soil development and associated Late Prehistoric archaeological materials. The age from levels 10-11 is more problematic because of quite intensive rodent burrowing at that depth in the section. Mixture of young and old charcoal could easily have occurred, and at that depth the assemblages are Archaic in character.

ARCHAEOLOGICAL INVESTIGATIONS

Testing

The site was relocated by personnel from UNT in 1985; lithic debitage and a projectile point were found in rodent backdirt piles. Based on results of testing conducted by ECI, additional testing was done in 1987. Testing consisted of six backhoe trenches (Backhoe Trenches 1-6) that were dug perpendicular to the channel of Isle du Bois Creek (Figure 13.1). Backhoe trenches cross-cut the natural levee and extended up on to the adjacent Pleistocene terrace (Figure 13.2). Two features were exposed by the backhoe trenches. Trench Feature 3/1 was a trash-filled pit that was 40 cm deep and Trench Feature 6/1 was 120 cm bs. Both features were manually excavated to recover associated cultural material. Cultural materials recovered during testing are listed in Table 13.3.

Excavations

Testing revealed the presence of stratified occupation materials and features in late Holocene alluvium, and especially associated with a buried soil, that was covered by younger, sterile levee sands (Figure 13.2, Table 13.3). This context contrasted with the shallowly buried and surficial materials on the Pleistocene terrace. After testing but prior to excavation, the site had been cleared of trees with heavy equipment by clearing contractors. This altered the original configuration of the ground surface, but did not disturb the buried soil.

The excavation strategy designed following testing involved placement of a block in the area of the deeply buried materials under the natural levee. Initial excavations were in Block 1, which measured 6x6 m. The block was placed in the levee area of the site, on the south side of Trench 5 (Figure 13.1). The sterile levee sands were manually skimmed and discarded. Thus "level 1" corresponds to the uppermost part of the buried soil.

Unfortunately, in May 1987 a large flood inundated the site towards the end of excavation of Block 1, just after two burials had been located. This damaged the exposed materials considerably. After the flood, the block was expanded to the west; this 5x6 m extension is called Block 2. In addition to loss of materials from Block 1, the flooding and subsequent weeks of inundation resulted in slumping of the excavation wall between Blocks 1 and 2. This is noted in the distribution figures described below. Because of differences in geologic context, data from these two blocks are reported separately. During the second phase of excavations, a burial was found in the northeast corner of Block 1. This was excavated in two 1 sq. m. pits called Block 3.

Table 13.3 Artifact Distributions
in Test Pits at the Merrill Site

DEPTH (cm bs)	East Coordinate E 45	E 50	E 55	E 60	E 65	E 70
0-10	3/-*	1/-	7/-	16/1	25/1	6/-
10-20	-	6/-	5/-	14/-	16/-	9/-
20-30	-	16/-	7/2	2/-	13/-	26/-
30-40	-	-	7/-	9/1	64/-	65/1
40-50	-	-	-	32/-	28/3	62/-
50-60	-	-	-	-	39/-	66/3
60-70	-	-	-	-	-	52/3
70-80	-	-	-	-	-	37/-
80-90	-	-	-	-	-	46/-
90-100	-	-	-	-	-	50/2
100-110	-	-	-	-	-	39/2
110-120	-	-	-	-	-	6/-

*debitage/tools

Features

Eleven features were exposed during block excavations at the Merrill site. All of these were in Block 1 except Feature 11, which was found in the northeast corner of Block 1, but was excavated as "Block 3", contiguous with Block 1 (Figures 13.1, 13.5). Features in Blocks 1-3 fall into two stratigraphic clusters: those in levels 3-6, and a group of features in levels 8-11). The deeper features are complex, owing to lack of lithostratigraphic markers in this zone of the site, and because larger boulders were used in several of the features. These two groups are discussed separately. Documentation of some of these features was thwarted by flooding and temporary inundation of the site during mitigation, followed by permanent saturation of the lower parts of the site matrix.

Upper Features

All of the features in the upper part of the section are hearths, and each appears to have been shallow and rock lined (Figure 13.5). These features appear to record a palimpsest of Late Prehistoric living surfaces. Features 1 and 2 were found in level 3. Feature 1 was a hearth with a small circular cluster of burned rock surrounded by charcoal stained sands. The hearth was about 8cm deep. Feature 2 was also a hearth, with an oval cluster of burned rocks ca. 50x40 cm in area and a depth of ca. 5 cm. This feature has been severely disturbed by rodent activity.

Feature 3 was found in level 4. It consisted of a shallow concentration of burned sandstone and limestone with a dark (10YR 3/2) sandy matrix. It was approximately 250x130 cm in area, and about 5 cm deep.

Feature 4, an undisturbed hearth, was found in level 5 and extended into level 6. It consisted of a cluster of burned rock measuring approximately 104x84 cm in area and 15 cm deep. No stain was associated with the burned rocks.

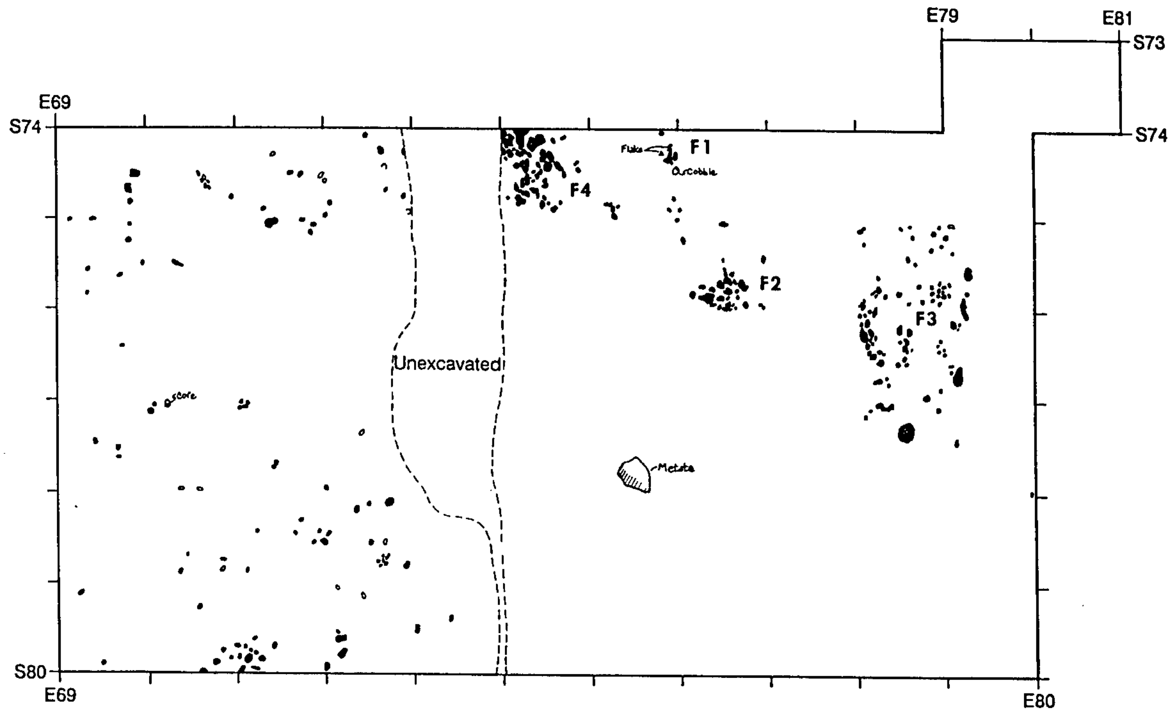


Figure 13.5 Plan of features, Merrill Site, Levels 3-4.

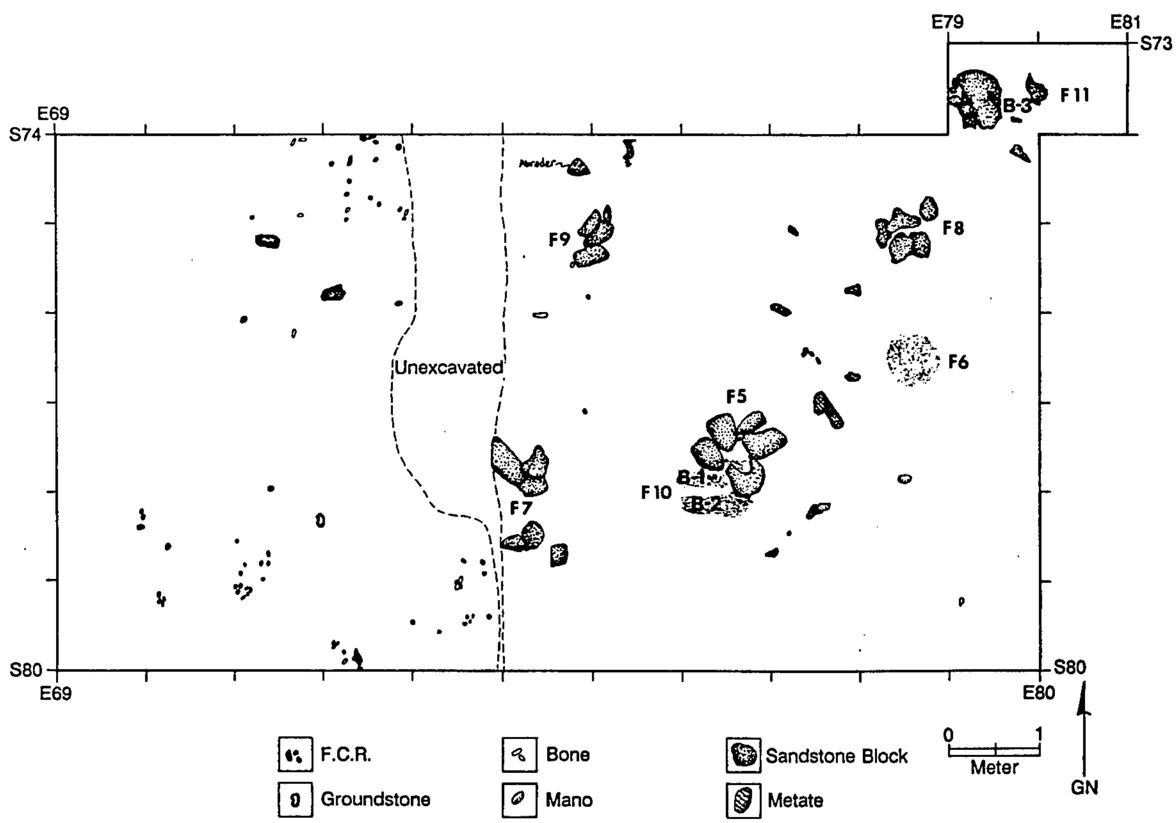


Figure 13.6 Plan of features, Merrill Site, Levels 7-12.

Lower Features

Features in the lower part of the section are quite different from the ones in the upper levels. These include three burials in two cairn-covered pits, other cairn-like rock clusters, and one simple pit. These features appear to have originated from a surface in level 7 and/or 8.

Feature 6 was a circular unlined pit; the upper profiles was found in level 8, and the pit extended to level 10. Rodent burrowing had mixed the pit fill with the surrounding matrix. The upper part of the pit was approximately 120x113 cm in area and the pit had a depth of 29 cm. Debitage, small pieces of burned rock, and burned and unburned bone were found in the pit fill. The function of the pit is not known, but it did not appear to be a hearth.

Features 5,7,8 and 9 are sandstone boulder clusters (Figure 13.6). The boulders in Feature 5 overlie the two burials in Feature 10. Feature 5 consisted of five large boulders forming a circular pattern measuring approximately 90x108 cm in area with a depth of 16 cm. The boulders were placed to form a rough circle. No stain was associated with the feature and there was no indication that this concentration of rock was a hearth. Feature 10 immediately underlies Feature 5. Feature 10 was a poorly defined pit that contained two human burials. These were marked by two crania and a single long bone (probably a femur). The bones were beneath Feature 5 and a large sandstone metate (see levels 5, 7, 8, and 9). A slight staining of the matrix was observed at the top of level 11 but its boundaries were indistinct. The crania and long bone were in very poor condition. Human skeletal material associated with Feature 10 was lost during the large floods during the excavations.

Feature 7, comprised of several large boulders, was first recognized in level 8; the bases of the boulders extended to level 10. A slightly stained, poorly defined pit was found below the southern part of the boulder cluster. It is possible that this was a burial pit, although no human bones were recovered.

Feature 8 is another large boulder cluster, first recognized in level 8 with the base of the boulders extending to level 10. It contained five large sandstone boulders, and was 70x67 cm in area with a depth of 25 cm. No stain was associated with this feature and there was no indication that this was a hearth.

Feature 9 was a concentration of large sandstone boulders that was approximately 50 cm in diameter. The tops of these rocks were encountered in level 10, and they extended at least to level 11. This feature was destroyed by flooding before excavation was completed.

Feature 11, the flexed burial of a single adult, was first recognized as a pit outline in level 7 and extended into level 13. The burial consisted of an oval pit measuring approximately 63x94 cm and with a depth of 45 cm. The skeletal remains were articulated, albeit somewhat disturbed by burrowing. The pit was stone lined; the sides had several slanting sandstone and hematitic sandstone slabs and the bottom had several flat-lying slabs. There was no indication of a rock cover over the burial. No grave goods were found associated with the burial, but an arrow point and darts points were found in the pit fill.

Although the different depths of the features suggest that they are manifestations of serial occupations, another interpretation is offered. The upper features are all hearths, marked by burned rocks. These were easily found in the very dark "midden-like" sands. Pit profiles were found only in the lighter sands below this. It is important that none of the upper and lower features overlap spatially, regardless of their depth. Thus the burial pits are spatially segregated from all hearth features. Another factor is that the truncated B-horizon surface slopes down toward the creek, and features in the eastern part of the block appear at lower elevations than those in the west. A plausible interpretation, but one that ultimately remains only plausible, is that most of the features here relate to the late Prehistoric occupations, and not to the Archaic occupations. Archaic materials occur towards the base of the block, and are mixed with the Late Prehistoric materials, yet the Late Prehistoric occupation appears to have been more substantial. Archaic hearths would have been easy to detect, but none were found in either Block 1 or Block 2. Likewise the only features found below the upper hearths are pits with large boulders. We suggest that these are excavated features from the Late Prehistoric occupation surfaces. Boulder features without bones <u>may</u> have been burials. Bone preservation in the burials was very bad,

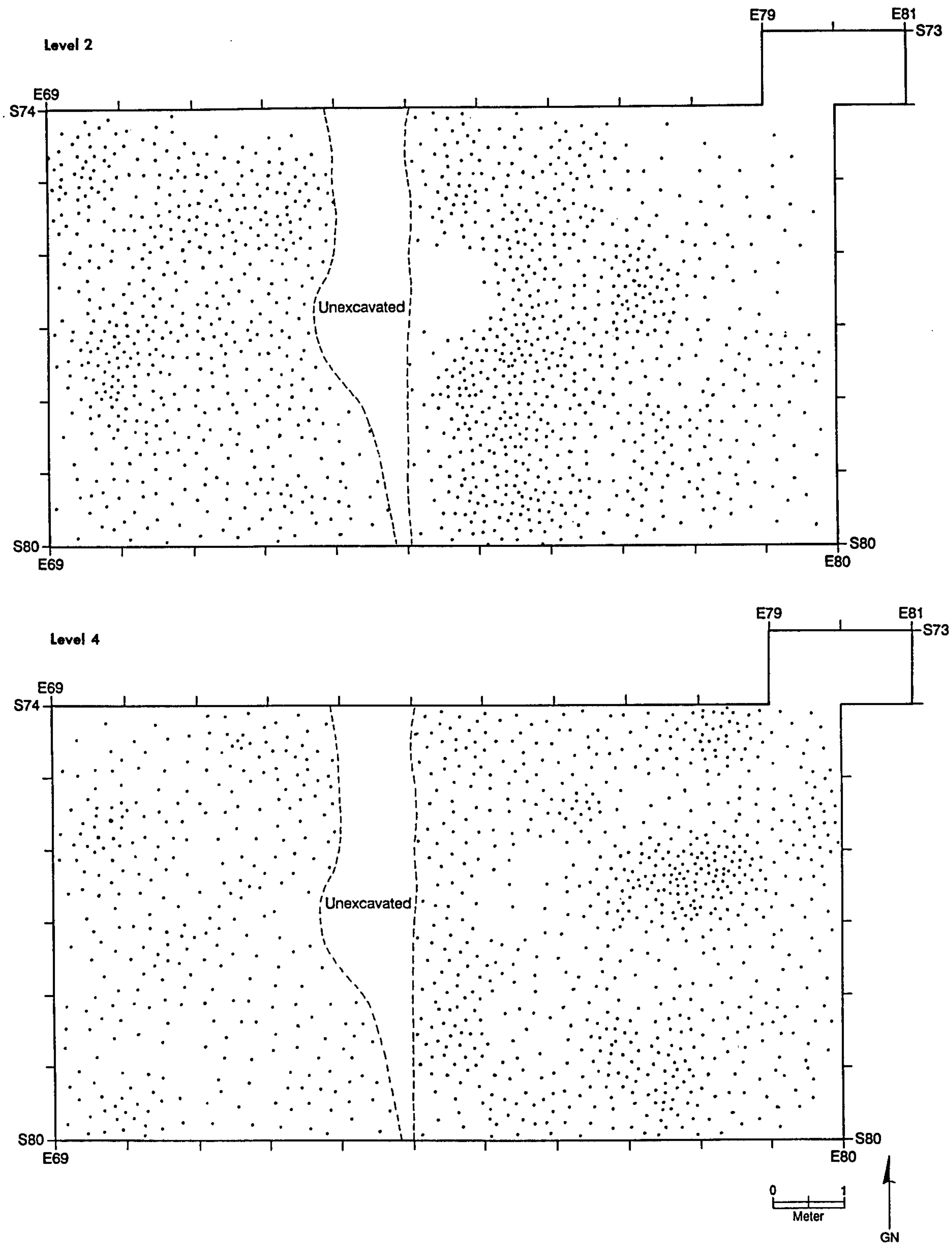


Figure 13.7 Debitage distributions, the Merrill Site.

and it is likely that bones from some burials may have been completely deteriorated. Contributing in this regard is the damage done to these features during the large flood.

Artifact Assemblages

Because of different site formation settings in the western and eastern part of the site, data from Blocks 1 and 2 are reported separately here (Tables 13.5-13.14). Despite similarity in block size, artifact density is greater in Block 2, as might be expected from the distribution of features. This argues for the spatial integrity of these deposits. The artifact assemblage from Block 1 differs from that in Block 2 in some general ways, particularly in the presence of ceramics, and the higher frequency of groundstone (Tables 13.5, 13.10). Both have low frequencies of unifacial tools and moderate numbers of blank-preforms and cores.

Artifact densities in Block 1 are high and fairly uniform from level 3 to level 10, with the highest density in level 2 (which contained no features). Erratic vertical changes in rock densities are manifestations of the features encountered in deeper levels. Bone densities track artifact densities, but burned bone is consistently more common in Block 1 where hearths are present. Mussel densities are quite low, reflecting poorer preservation potential as well as probable lower availability in the sandy Isle du Bois Creek channel.

With respect to raw material use and technology, the blocks are fairly consistent in having low frequencies of chert debitage throughout (Tables 13.7, 13.12). Large pieces of debitage are common, but these are mainly quartzite. Cortical debitage declines slightly up through the section in Block 2, while lower frequencies of cortical pieces are evident in levels 6-7 in Block 1. Chert use for tools is highest among arrow points, especially in Block 1 (Table 13.8). However, in the deeper levels of that block, chert dart points are common. Chert unifacial tools are restricted to the deeper levels of Block 1. The clear majority of blank-preforms and cores are made of Ogallala quartzite in both blocks, although blank-preforms in the upper levels of Block 2 exhibit slightly more chert materials (Table 13.13). Some of these appear to have been recycled dart point fragments.

Table 13.5 ASSEMBLAGE COMPOSITION, DN99, BLOCK 1

Level	Deb	Cores	Blank-Pre	Uniface	Proj Pt	Grnd Stn	Sherds	N
2	760		9		10	2	2	781
3	817		5	1	16	5	1	844
4	780	2	4		10	2		798
5	667	2	7	2	6	1	2	685
6	739	1	3		7	1	2	751
7	561		5		7			573
8	479		3		6			488
9	518	1		2	5			526
10	580	2	4	2	7			595
11	394	2	3		5	1		405
12	285	1	3	1				290
13	108							108
14	54	1	1					56
15	26				1			27
TOTAL	6768	12	47	8	80	12	7	6927
%	97.70	0.17	0.68	0.12	1.15	0.17	0.10	

Table 13.6 ARTIFACT DENSITIES, DN99, BLOCK 1

level	base lev	debden (n/m3)	artden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
2	99.40	174.00	180.00	26.29	4320.9	58.00	30.10
3	99.30	180.00	187.71	98.00	6959.1	118.00	35.30
4	99.20	168.57	173.71	90.57	7024.0	161.71	36.80
5	99.10	153.14	158.57	235.71	8110.9	226.86	37.20
6	99.00	160.29	163.71	100.57	10408.3	219.43	30.00
7	98.90	134.29	137.71	26.29	8082.9	180.29	34.40
8	98.80	106.29	108.86	7.71	15072.6	144.86	27.20
9	98.70	106.86	109.14	38.29	20055.4	156.57	19.90
10	98.60	86.36	90.91	6.36	4139.4	94.55	26.00
11	98.50	95.31	98.75	25.00	62365.0	78.44	22.70
12	98.40	85.00	86.67	0.00	1139.7	41.67	30.40
13	98.30	51.05	51.05	0.00	541.6	32.11	18.00
14	98.20	55.56	57.78	0.00	16488.9	11.11	50
15	98.10	80.00	83.33	0.00	370.0	3.33	0
Mean		130.83	134.66	72.22	10413.3	169.18	28.26
Std Dev		36.17	37.36	69.73	17178.7	65.58	6.41

Table 13.7 DEBITAGE, DN99, BLOCK 1

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
Level									N	%	%	%
2	188	43	168	109	34	8	44	15	609	0.17	0.29	0.55
3	182	31	174	110	52	5	57	19	630	0.21	0.26	0.57
4	207	20	168	74	48	6	57	10	590	0.21	0.19	0.52
5	156	25	171	83	33	3	50	15	536	0.19	0.24	0.60
6	181	7	206	76	34	1	47	9	561	0.16	0.17	0.60
7	116	12	178	65	28	0	69	2	470	0.21	0.17	0.67
8	87	10	147	82	16	0	26	4	372	0.12	0.26	0.70
9	96	10	134	74	21	0	29	10	374	0.16	0.25	0.66
10	60	6	106	68	17	1	24	3	285	0.16	0.27	0.71
11	83	4	111	57	21	0	29	0	305	0.16	0.20	0.65
12	81	8	77	51	18	0	18	2	255	0.15	0.24	0.58
13	37	1	27	15	5	0	11	1	97	0.18	0.18	0.56
14	13	2	14	13	2	0	5	1	50	0.16	0.32	0.66
15	5	1	8	3	4	0	3	0	24	0.29	0.17	0.58

TABLE 13.8 ARTIFACT TYPOLOGY, SITE 41DN99, BLOCK 1
(x/x = chert/quartzite)

CLASS/ Type		L	E	V	E	L							
	2	3	4	5	6	7	8	9	10	11	12	14	15
ARROW POINTS	4/4	9/2	1/2	2/1	-/1	1/2							
DART POINTS	1/1	1/4	1/6	1/2	2/4	2/2	1/5	1/4	4/3	2/3			1/-
UNIFACIAL TOOLS													
Typ endscraper								-/1					
Atyp endscraper								-/1					
Double sidescraper		-/1		-/1									
Unilateral retouch				-/1					2/-		1/-		
Burin on biface										1/-			
BLANK-PREFORMS													
Blank-preforms	-/3	-/5	-/3	-/5	1/-	-/4	-/3		-/4	1/1	-/2	-/1	
Biface fragments	2/4		1/-	1/2	1/1	-/1				-/1	1/-		
CORES													
Discoidal			-/1					-/1		1/-			
Single platform, flake			-/1										
Multiple plat, flake									1/1	-/1	1/-	-/1	
Opposed plat, flake				-/2									
Core fragment	-/1	-/1		1/-			-/1		-/1				
GROUND STONE													
Unifacial mano		2	1										
Double pitted mano					1								
Double mano	1												
Simple metate		2	1										
Prepared metate				1									
Grooved shaft abrader										1			
Hammerstone	1	1											
TOTAL	22	28	18	20	11	12	10	8	16	12	5	2	1

Table 13.9 PROJECTILE POINT TYPOLOGY , DN99, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	LEVEL										
	2	3	4	5	6	7	8	9	10	11	15
ARROW POINTS											
Alba				-/1							
Bonham		2/1		1/-							
Catahoula	-/2	3/-		1/-							
Fresno	1/-										
Washita		1/-				-/1					
", serrated	1/-	-/1				1/-					
Scallorn		2/-	1/-			-/1					
Indeterminate	2/2	1/-	-/2		-/1						
Subtotal	8	11	3	3	1	3					
PCT chert	50	82	33	67	0	33					
DART POINTS											
Gary	1/-	-/1		-/1	2/1	1/-	-/1	1/1	1/1		
Gary knife										-/1	
Kent, atypical		1/-	-/1				-/1				
Edgewood		-/1									
Ensor, atypical								-/1			1/-
Ellis									1/-	-/1	
Godley			-/1		-/2						
Marshall, atypical										-/1	
Yarborough						-/1					
Carrollton									1/-	2/-	
Untyped (paleo?)						1/-	1/-		1/-		
Indeterminate	-/1	-/2	1/4	1/1	1/1	-/1	-/3	-/2	-/2		
Subtotal	2	5	7	3	7	4	6	5	7	5	1
PCT chert	50	20	25	33	43	50	17	20	57	40	100

Groundstone is clearly concentrated in the younger occupation horizons. These include simple manos and metates, and also some larger well-prepared manos and a large sandstone metate from level 5 of Block 1. The grooved shaft abrader in level 11 is probably associated with Feature 8. Not listed in Table 13.8 is a boatstone recovered from level 12. This piece is made of local hematite. It is broken in half and exhibits a deep, rectilinear trough shape with thin walls. It is finely ground on all surfaces but still exhibits striations. This piece is almost certainly associated with the Archaic components of the site. These artifacts occur most commonly in Late Archaic (ca. 2,500-1,800 yr BP) contexts in northcentral and east Texas (Story et al, 1990).

The sample of unifacial tools is very small, but includes a number of typical endscrapers and sidescrapers and a few retouched pieces. A single burin was found in Block 1, and a quartzite chopper was found there in level 6. It is noteworthy that all of the unifacial tools in the upper levels are made on Ogalalla quartzite. Only three retouched pieces in the deeper levels are made on chert. The use of quartzite for scrapers contrasts with chert use at Late Archaic sites such as 41CO150 and 41CO144. Perhaps more important is the clear concentration of unifacial tools with the younger occupations here, especially in Block 2. In Block 1 the few unifacial tools are found in two stratigraphic clusters (levels 3-5 and levels 9-12). The upward increase in unifacial tools is associated with upward increases in arrow points, blank-preforms, ceramics and groundstone. It also correlates with the upward decrease in cores. This indicates a shift in on-site activities between the earlier and later occupations, ie. between Late Archaic and Late Prehistoric occupations.

The projectile point assemblage is quite diverse (Tables 13.9, 13.14). In Block 1, arrow points occur down through level 7, while in Block 2 they are present only down through level 5. This difference is probably a manifestation of different feature construction activities in Block 1. On the other hand, the arrow points in Block 2 do not include some of the younger Washita forms as recovered from Block 1. Proportionately more dart points were found in the shallow levels of Block 2 compared to Block 1. Nonetheless, in these sandy sediments it is somewhat surprising that this partial stratification of arrow and dart points is still clear.

Because of the larger sample size, Block 1 exhibits more typological variation than Block 2 (Figure 13.8). Among the arrow points there appears to be a rough stratification of types, with Washita, Starr and Catahoula more common in the upper levels. The single Washita from level 7 is atypical, and arrow points

Table 13.10 ASSEMBLAGE COMPOSITION, DN99, BLOCK 2

Level	Deb	Cores	Blank-Pre	Uniface	Proj Pt	Grnd Stn	N
2	535		5	2	15	1	558
3	376		5	1	8		390
4	308	1	6	1	4		320
5	283		4	1	3		291
6	324	2	4	1	7		338
7	265	3	3		1		272
8	241				2	1	244
9	238				4		242
10	184		4				188
11	86		1		2		89
12	30		1	1			32
13	4						4
14							0
15							0
TOTAL	2874	6	33	7	46	2	2968
%	96.83	0.20	1.11	0.24	1.55	0.07	

below level 5 are probably intrusive. Three of the Washita points are serrated, but lack the basal notch and overall form of the Toyah type. Also common are Scallorn and Bonham types, most of which are made of chert.

Gary type points have the greatest vertical distribution of any projectile form. Also present is a piece classified as a Gary knife owing to its size (Figure 13.8, 11a). In the upper levels, other dart point forms include atypical Kent-like pieces, an Edgewood and a Godley. The middle levels (6-9) also have Gary, Godley and Yarborough forms. In the deeper levels, different dart point types are present. These include atypical Marshall, Ellis and Carrollton. All of these appear to be Late Archaic, including several older point forms that are represented by reworked or basal fragments of chert pieces. Nonetheless, the lower assemblage of dart points is assumed to be older than the ca. 1,400 BP radiocarbon age from levels 10-11. These materials rest on the truncated B-horizon and were disturbed by the deep features at these levels.

The projectile point assemblage from Block 2 is quite comparable to that from Block 1, despite the smaller sample. Scallorn, Alba and Catahoula are the only diagnostic arrow point types present (Table 13.14). Gary forms are the most common dart points, clearly dominating the upper levels, but exhibiting considerable vertical distribution as in Block 1. The other dart point types present are atypical Marshall and Carrollton forms, with single examples of Elam, Edgewood and Godley.

The high percentage of chert dart points in level 6 of Block 2 is noteworthy. This appears to be paralleled by higher chert raw materials among dart points in levels 6-7 in Block 1. The chert points in these combined levels include Gary, Edgewood, and atypical Marshall. Chert Gary points were noted in assemblages from 41DN103 and 41CO141, in association with Scallorn and Alba arrow points.

The projectile points from 41DN99 appear to reflect bioturbated stratification. There is clear segregation of arrow points from the lower levels, yet mixture with dart point forms is evident. However, many of the dart point types in the upper levels are varieties of Gary, and are chert dominated. Rather than simply assume that these were made and used contemporaneously with the whole suite of arrow point types, it seems more reasonable to consider that all artifacts in the upper levels have been bioturbated to a moderate degree, resulting in some uncertain degree of artificial association. In the deeper levels, a Late Archaic suite of point forms is present, for which the ca. 1,400 BP radiocarbon age is considered minimal at best.

Table 13.11 ARTIFACT DENSITIES, DN99, BLOCK 2

level	base lev	debden (n/m3)	artden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned bone
2	99.40	194.23	203.08	4.23	2508.8	49.23	28.90
3	99.30	138.85	144.23	28.85	2550.4	103.08	42.90
4	99.20	116.54	121.15	16.15	931.5	100.38	20.30
5	99.10	103.85	106.92	15.38	2868.1	137.31	12.30
6	99.00	119.23	124.62	15.00	1199.2	141.15	15.30
7	98.90	111.30	114.35	14.78	718.3	123.48	12.30
8	98.80	99.13	100.43	29.57	593.0	234.78	17.60
9	98.70	105.00	106.82	0.00	1408.6	41.36	19.80
10	98.60	111.88	114.38	0.00	4322.5	55.63	6.70
11	98.50	66.15	68.46	0.00	173.1	8.46	45.50
12	98.40	48.33	51.67	0.00	15.0	3.33	100.00
13	98.30	20.00	20.00	0.00	0.0	0.00	
Mean		109.56	112.67	12.98	1720.2	119.16	24.98
Std Dev		31.93	32.84	9.95	1309.3	72.50	27.43

Table 13.12 DEBITAGE, DN99, BLOCK 2

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
Level	INT	CTX	INT	CTX	INT	CTX	INT	CTX	N	Chert %	Cortex %	Large %
2	116	6	236	82	18		44	3	505	0.13	0.18	0.72
3	103	12	144	47	15	1	32	7	361	0.15	0.19	0.64
4	89	4	106	49	25	1	28	1	303	0.18	0.18	0.61
5	65	7	111	46	15		26	0	270	0.15	0.20	0.68
6	100	6	107	58	4		34	1	310	0.13	0.21	0.65
7	68	1	103	46	10		25	3	256	0.15	0.20	0.69
8	61	5	84	41	17		14	6	228	0.16	0.23	0.64
9	61	11	71	48	5		31	4	231	0.17	0.27	0.67
10	52	8	61	38	11		9		179	0.11	0.26	0.60
11	21	6	26	21	4		8		86	0.14	0.31	0.64
12	5	1	8	14			1		29	0.03	0.52	0.79
13	2			2					4	0.00	0.50	0.50

TABLE 13.13 ARTIFACT TYPOLOGY, SITE 41DN99, BLOCK 2
(x/x = chert/quartzite)

CLASS/ Type		L	E	V	E	L					
	2	3	4	5	6	7	8	9	10	11	12
ARROW POINTS	3/4	1/1	1/-	2/-							
DART POINTS	2/6	2/4	1/2	-/1	6/1	-/1	-/2	1/3		-/2	
UNIFACIAL TOOLS											
Sidescraper	-/1										
Double sidescraper		-/1	-/1								-/1
Bilateral retouch	-/1										
Burin on proj pt frag				-/1							
Chopper					1						
BLANK-PREFORMS											
Blank-preforms	1/4	-/5	1/5	1/2	-/3	-/3			1/2	1/-	
Biface fragments				1/-	-/1				-/1		1/-
CORES											
Discoidal					1/-						
Multiple plat, flake						-/1					
Opposed plat, flake						-/1					
Core fragment			-/1		1/-	-/1					
GROUND STONE											
Unifacial mano			1				1				
TOTAL	23	14	12	8	14	7	3	4	4	3	2

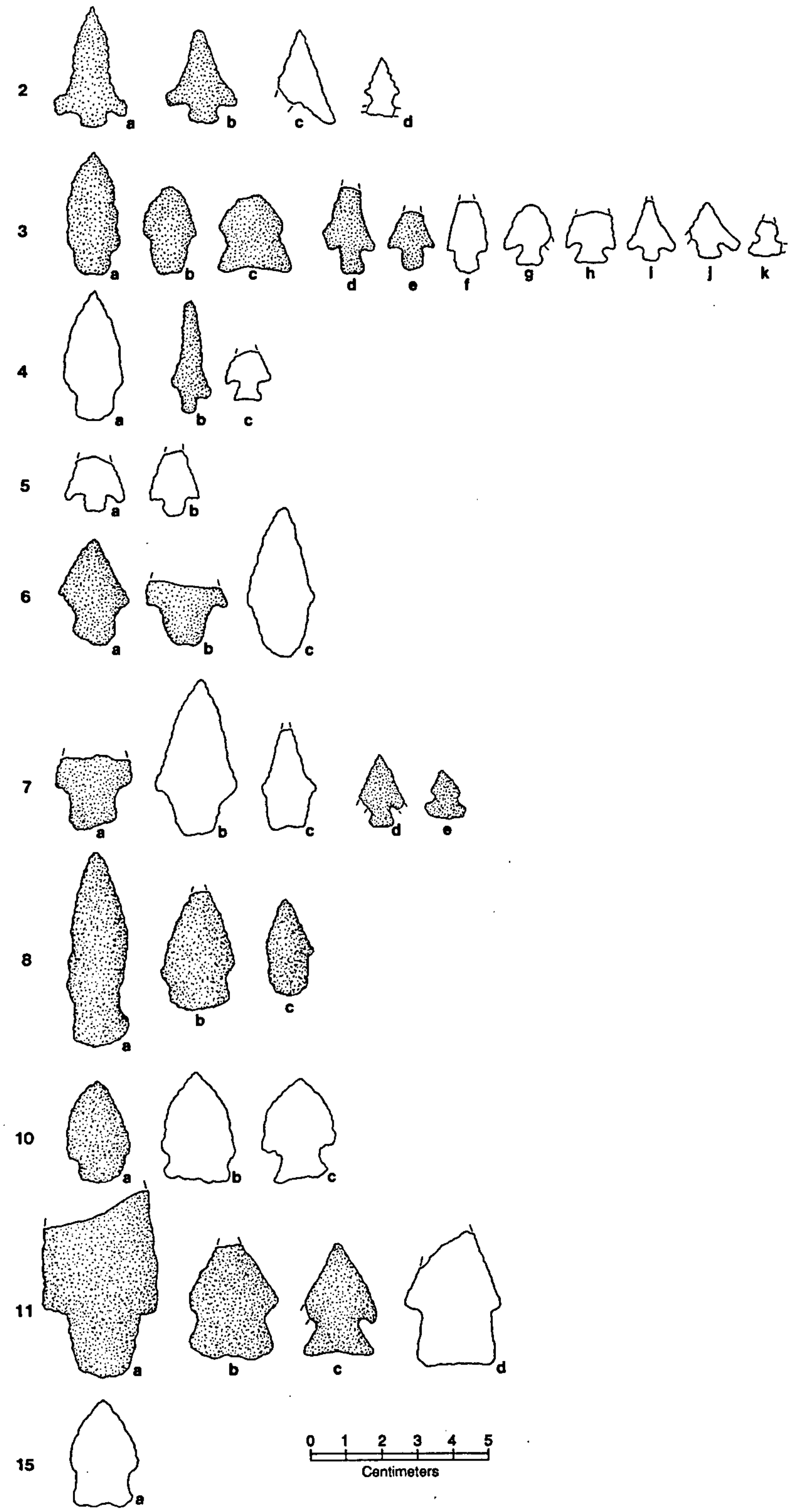


Figure 13.8 Projectile points, the Merrill Site, Block 1.

Table 13.14 PROJECTILE POINT TYPOLOGY, DN99, BLOCK 2
(x/x = chert/quartzite)

CLASS/Type	LEVEL								
ARROW POINTS	2	3	4	5	6	7	8	9	11
Alba, serrated				2/-					
Catahoula		-/1							
Scallorn	-/1	1/-							
Indeterminate	2/2		1/-						
", serrated	1/1								
Subtotal	7	2	1	2					
PCT Chert	43	50	100	100					
DART POINTS									
Gary	-/3	2/1	-/2	-/1	1/-	-/1			-/2
Gary knife							-/1		
Edgewood					1/-				
Elam	1/-								
Godley								-/1	
Marshall, atyp.					2/-			-/1	
Carrollton, atyp.		-/2							
Indeterminate	1/3	-/1	1/-		2/1		-/1	1/1	
Subtotal	8	6	3	1	7	1	2	4	2
PCT Chert	25	33	33	0	86	0	0	25	0

Ceramics

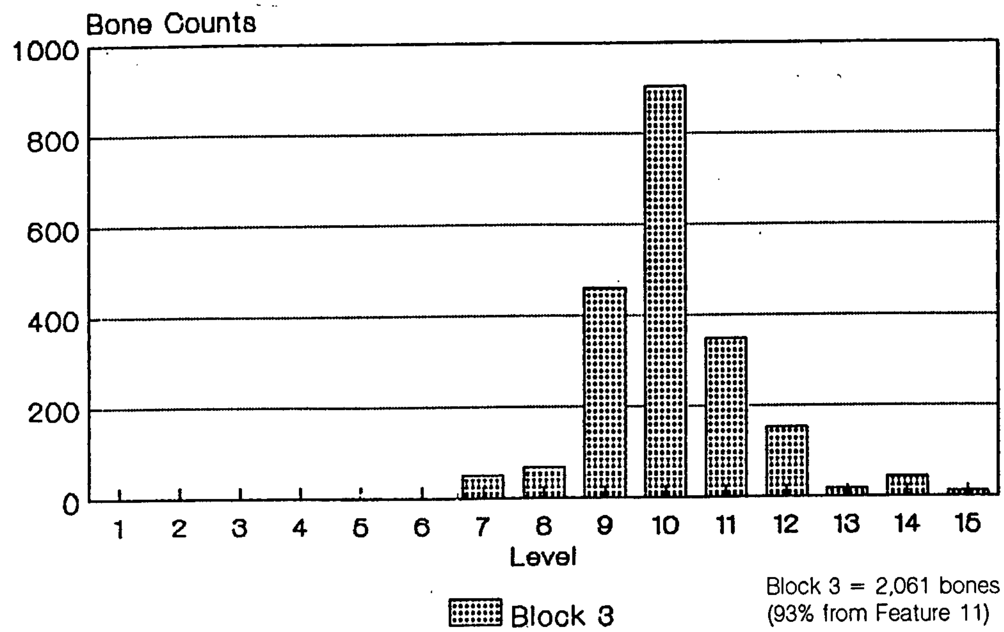
Nine small sherds were recovered from levels 2-7 in Block 1. None were recovered from Block 2. Each of these is shell-tempered, and exhibits plain interior and exterior surfaces. These sherds are clearly in stratigraphic association with the Late Prehistoric occupations, although they are probably associated with the later part of the Late Prehistoric, marked here by Washita and Catahoula point types. Association with the assemblage of Scallorn, Alba and Gary points would be unique for the Ray Roberts sites, and unusual compared to sites in the region that contain those point types, but have ceramics that are only rarely shell-tempered.

ZOOARCHAEOLOGY

Approximately 12,300 fragments of animal bone were recovered from three excavation blocks at 41DN99, with densities averaging about 300 bones per cubic meter (Tables 13.6, 13.11). Faunal recovery was greatest from Block 1 (Figure 13.9).

Fifteen per cent of the total bone that was recovered was subsequently identified (Table 13.15). Most of these remains were recovered from Block 1, which accordingly produced 76% of the identified elements (n=1,387). Block 2, which was almost as large as Block 1, yielded only 160 identified faunal remains. Block 3 (a 1x2 m unit) yielded 242 elements, 212 of which were from Feature 11. To simplify presentation of the identified faunas in one table (Table 13.15), the levels in Blocks 1 and 2 have been aggregated according to temporal association. The composition of the taxa is similar in Blocks 1 and 3 where differences exists in numbers rather than kinds, especially in the lower levels of Block 3 where fine-screening of Feature 11 enabled retrieval of small mammalian and non-mammalian remains. The paucity of identified remains in Block 2, which has only 10 taxa, may be explained by the lack of fine-screened features in this block.

Within Block 1, there are essentially no differences in the composition of identified faunas in the upper levels, which are associated with Late Prehistoric occupations, and the lower levels (8-12), which are associated with Archaic occupations. Taxa found exclusively below level 5 are amphibians (which may be intrusive), snakes, squirrel, and badger. Raccoon and mole occur exclusively above level 6. These are primarily singular



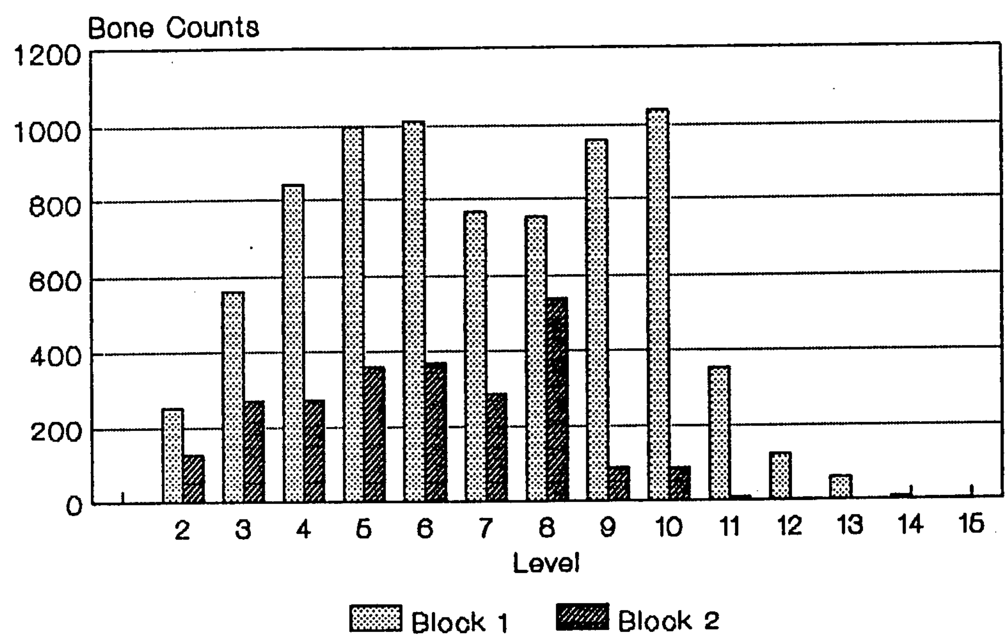


Figure 13.9 Total bone recovered per level, 41DN99.

occurrences from which little inference can be made. Using the taxa list from Block 1, however, it is apparent that multiple habitats were used for procuring animal foods and that a variety of animals were selected. For example, there are five genera of turtles and at least four individual birds of different species represented in the faunal remains.

Table 13.15 Identified Taxa, DN99, Blocks 1,2,3

	LEVEL														
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TU1
Gar									1						
Catfish			1	2	1			1							
Indet. Fish	1							5	6	1	1	1			
Toad						1									
Indet. Toad/Frog						4		2	25		2				
Snapper									1						
Slider		1					1								
Mud Turtle			1												
Musk				1	2										
Musk/mud	1		3		2										
Box Turtle	1	7	34	23	6	7	6	9	3	1			1		2
Soft Shell		1		1		1									
Indet. Turtle	31	56	88	113	83	63	52	75	79	30	16		15		12
Non-ven. Snake								1	1						
Indet. Snake						1					1				
cf. Goose						1									
Coot					1										
Prairie Chicken									1						
Indet. Bird, sm							1				1				
Indet. Bird, med				2	2	2									
Indet. Bird, lg				1		1	1	2		1					
Mole					1										
Cottontail	1	1	10	7	5	2	5	16	10	6	4				2
Swamp Rabbit															1
Swamp/Jack Rabbit			3		1			1	1						
Beaver				1	2	1		1							
Tree Squirrel							1	1	1						
Pocket Gopher				1	2			1	6	4	2				2
Cotton Rat		3	3	2	4	6	6	7	11	2			1		1
Vole				1	1										
Indet. Rodent	1		2	3	4	8		22	43	2	1				1
Mink			1												
Raccoon			1	2											
Badger						2	3	1							1
Dog/Coyote		2		1	2		1	1							
Deer	5	9	36	24	13	20	19	11	11	7	5			1	7
Pronghorn															1
Deer/Pronghorn	8	22	34	45	56	34	38	35	41	8	16	4	2	1	7
cf. Bison							1					1			
Indet. Mammal, sm		1		4	1		1	2	3	3					
Indet. Mammal, med	2	1	4	7	3	9	2	5	13	3					5
Indet. Mammal, lg		3	1	11	11	23	14	10	6	6	2				8
NISP*	51	107	222	252	203	186	152	209	263	74	51	6	19	2	50
# of Taxa	9	12	15	20	21	18	16	21	19	13	11	3	4	2	13

* Number of identified specimens

There is also a full assortment of fur-bearers in this assemblage: beaver, mink, raccoon, badger, in addition to the usual game animals, such as rabbits, squirrel, deer, and the occasional pronghorn and bison. These last two species represent exploitation of the grasslands or the incursion into the bottomlands by these species to get water. Whether they were hunted in the prairies or ambushed at watering places is not clear; however, neither was taken as a matter of course else there would be more elements from these species in the faunal assemblage.

Deer is the most abundant taxon at this site. Every level between levels 4 and 12 of Block 1 had evidence of more than one individual, based either on paired element analysis or dental ages. Levels 10 and 11 had three individuals each, ranging in ages of less than 20 months to in excess of 7 years old at death. Throughout the occupation, there does not appear to be selection of deer based on age. Figure 13.10 displays the distribution of carcass parts for each of the levels in Block 1 and the MNI for deer. Level 2 differs from the other levels in that only non-meaty waste elements are present, suggesting a butchering locus. From these data, it is also apparent that number of elements has no direct relation to MNI; for example, level 11 only has 12 elements, but from the dentition, three individuals are depicted. The disproportionate representation of elements in level 11 compared to the other levels points to an undetected refuse area somewhere outside the excavated units. All carcass parts are represented, but not enough elements are present to account for three individuals. The absence of ribs and vertebrae in the upper levels may be a result of poor preservation of these less durable elements.

Taphonomic analysis of deer elements for each level reveals that exfoliation and etching is highest in levels 3 and 4, corresponding to the absence of ribs and vertebrae (Fig. 13.11a). Unfortunately, sample size is too small in level 2 to be meaningful. Another increase in etching and exfoliation occurs in level 9 where overall element representation decreases, and where these indicators of deterioration are low, numbers of elements are high (compare with Fig. 13.10).

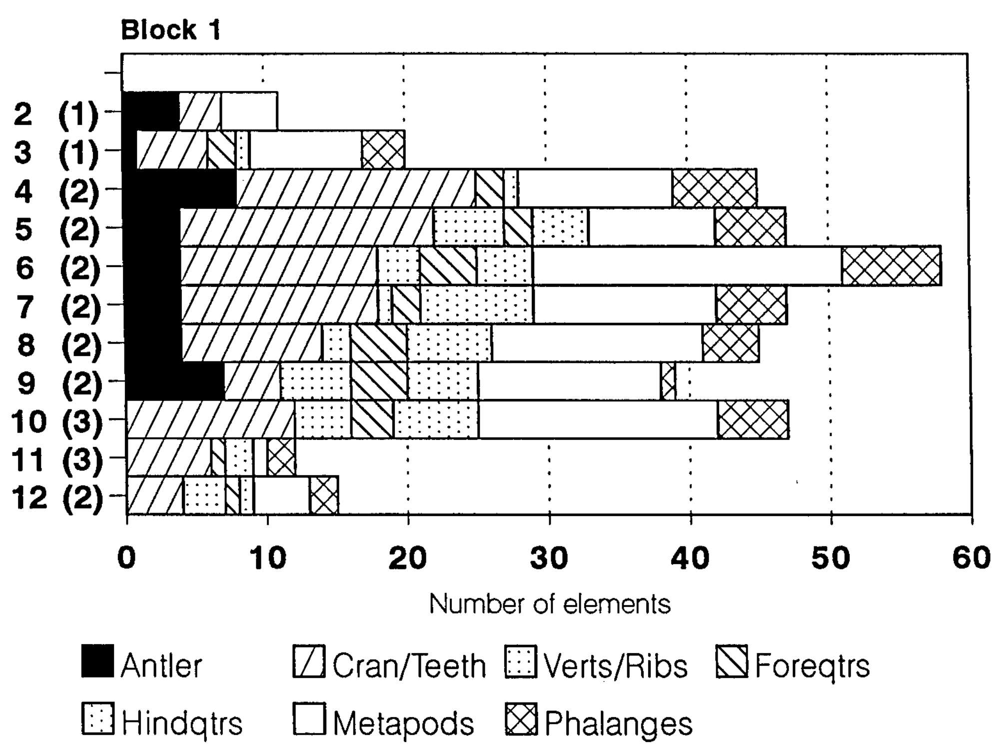


Figure 13.10 Vertical distribution of deer carcass parts, 41DN99.

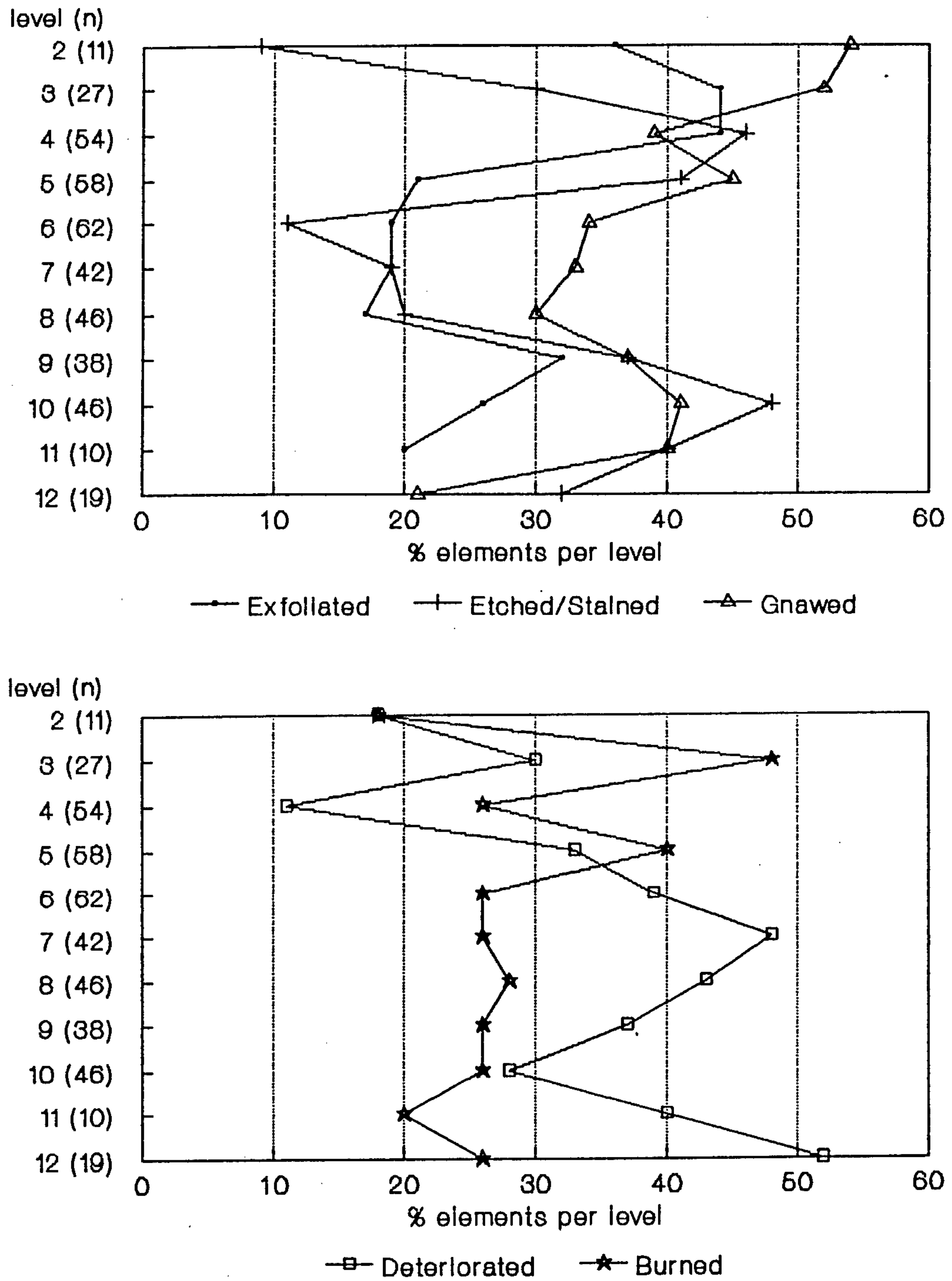


Figure 13.11 Taphonomy of post-cranial deer elements, 41DN99.

Table 13.16 Fauna from Features, 41DN99

TAXA	FEATURE No.: 1	2	3	4	5	6	7	8	11
Catfish				1		1			
Gar									1
Fish, small						5		3	4
Toad/frog						3		19	6
Snapping turtle								1	
Mud turtle			1						
Musk/mud turtle									1
Box turtle	1		1	1	1			1	2
Indet. turtle	1	5	9	6	2	18		5	91
Indet. snake									1
Non-ven. snake									2
Prairie chicken						1			
Bird small									1
Cottontail				1	2	10		1	17
Swamp/jack rabbit						1			1
Squirrel					1	1			
Pocket gopher						1			10
Cotton rat				1	1	5		2	6
Vole				1					
Indet. rodent		1		1	1	23		4	40
Badger						1			
Deer	1	1	1	4	1	8	1	2	17
Mammal small						2			3
Mammal medium	1					2			5
Mammal large						2			4
Unidentified	69	53	106	263	42	449	64	135	1,646
Unid burned:	45	38	65	49	6	138	10	30	495

Figure 13.11b departs from what has been seen at other sites where there is an inverse relation between burning and massive bone deterioration. Here in Block 1, the two indicators tend to track each other. The sandy soil at this site probably exacerbates the deleterious effects of leaching on the bone lying in the porous substrate, negating any preservative effect of charring.

Level 3 of Block 2 contains a higher percentage of burned bone than any other level. While burned bone (from quarter-inch screening only) remains consistent at about one-third of the faunal debris throughout the levels of Block 1, Block 2 has proportionately high frequencies of burned bone only in the upper three levels. This is noteworthy because there are no fire-related features evident in Block 2. The origin of the burned bone there is unclear. These burned remains may be related to Feature 11 in Block 3 in which almost half of the animal bone is charred.

Feature 11 was a circular pit with a single, flexed human burial. It was lined with sandstone slabs, and the adult human bone is badly rodent gnawed. Almost 2,000 animal bones were also in the pit, a third of them burned (Table 13.16). The extensive disturbance caused by rodent burrowing has mixed the burial in with food debris from an earlier midden. A basin-shaped trash pit (Feature 6) was identified in level 8 of Block 1. A single human skull fragment was also found with the faunal remains from Feature 1, a scatter of FCR and lithics near midden refuse in level 3 of Block 1.

Identified faunal remains from features are provided in Table 13.16. There is an abundance of rodent remains from each feature, but this is probably a result of fine-screening collection procedures. Features 6 and 11 are similar in faunal composition, each having over 16 taxonomic categories of identified remains that include all five vertebrate classes.

Modified bone is extremely fragmentary. Butchering marks were noted on only nine fragments; all but one from Block 3 are cuts on fragmentary elements of large or medium-size animals. More numerous are worked fragments (n=15) mainly in the form of burned, tool mid-sections (Table 13.17). A few fit the category of awl, but the functions of most of the bone tool remnants are unknown because of their fragmentary condition. The inventory in Table 13.17 provides provenience information, element (if known), condition, cross-section shape, and commentary on the fabrication of each specimen.

Table 13.17 Bone Tools, 41DN99

Block (lv) Unit	Element	Comment
1(4) S78/E76	splinter	burned, thick, mid-tool
1(4) S76/E76	bird? bone	edges smoothed, slightly striated, mid-tool
1(5) S75/E79	splinter	burned, flat, mid-tool
1(5) S78/E79	splinter	burned, tapers, mid-tool
1(5) S77/E80	splinter	burned, flat, tapers, tip has longitudinal striae, body has perpendicular striae
1(6) S77/E76	splinter	unburned, flat, mid-tool w/notches on one smoothed edge
1(6) S75/E77	deer ulna	burned, flat, mid-tool
1(6) S77/E77	splinter	burned, triangular, mid-tool
1(6) S78/E77	splinter	unburned, oval, mid-tool
1(7) S78/E78	splinter	burned, triangular, mid-tool, approx. 4 mm thick
1(7) S80/E78	splinter	burned, broken longitudinally
1(9) S76/E79	ulna?	burned, flat, tapering, mid-tool
1(9) S78/E79	metapodial	charred, round, mid-tool
1(9/10) Fea.6	metapodial	burned, broken longitudinally
2(5) S77/E73	splinter	burned, longitudinal striations in medullary cavity

SUMMARY

The Merrill Site has stratified Late Archaic and Late Prehistoric occupation materials that provide evidence of activities and subsistence during the Late Holocene. Archaic occupations were apparently repeated visitations by peoples primarily engaged in hunting/collecting a diverse set of faunas. Few features were constructed, and most of the lithic assemblage reflects biface manufacture and tool use activities. The projectile point typology and a few other diagnostics such as the boatstone indicate Late Archaic occupations; no radiocarbon ages were obtained on these occupation horizons, as bioturbation precluded collection of viable samples for dating. Marked differences in raw material use are evident among tool classes, with chert being common among most tool classes except blank-preforms, which are dominated by local quartzites. This suggests significant raw material importation, probably as finished tools or large tool blanks during this period.

Late Prehistoric archaeological data evidence changes in site activities as well as intensity-periodicity of occupation. These later occupations appear to have spanned a considerable portion of the Late Prehistoric period, based on projectile point forms and ceramics. The paucity of ceramics, however, suggests either that the major occupations were during the earlier part of the Late Prehistoric period, or that the occupations were related to hunting-dominated activities. Raw material use patterns contrast somewhat with those of the Late Archaic. Cores are less common and all are made of local material. The same pattern is true for unifacial tools. The high chert use for arrow points may reflect use of older points as blanks. Late Prehistoric features include rock-lined hearths and burials. No evidence for architecture was found, but postmolds would have been very difficult to detect in the sandy, bioturbated sediments. Grinding stones are more common than in the Late Archaic. Faunal data, however, show no significant changes in resource procurement patterns.

IV. GEOARCHAEOLOGY: TERRACE SITES

INTRODUCTION

Excavations were conducted at four terrace sites at Ray Roberts. These settings were considered less desirable, owing to stable sedimentary environments and diminished potential for geologic and archaeological stratigraphy. Work at terrace sites was however, stipulated in the scope work negotiated between the USACE and the State Historic Preservation Officer, in favor of the potential significance of "shallow" sites. In the main, these adverse geologic conditions were encountered at these four sites, although notable exceptions were encountered, and certain significant archaeological data were recovered. In addition, we feel that more has been learned about site formation in terrace situations, and later propose strategies for detecting and evaluating favorable geoarchaeological situations associated with terrace sites.

Two of the sites, 41DN79 and 41DN81, are in essentially identical positions on a Denton Creek terrace of the Elm Fork Trinity. The other two sites (41DN346 and 41DN102) are on terraces of Isle du Bois Creek. Because the alluvium associated with Denton Creek terraces is almost always sandy, these four sites formed in geologically similar settings, at least as far as the terrace surface per se is concerned. As shown by discussions below, the site formation settings off the terrace surface are different, and in two cases (41DN79 and 41DN102) provided better site formation settings.

CHAPTER 14
THE RANDY SITE (41DN346)

INTRODUCTION

Location

Site 41DN346 is located on the first terrace of Isle du Bois Creek adjacent to the modern channel (Figure 14.1). The site was reported when a buried burned rock feature was observed eroding out of the stream bank. The site area is approximately 20 m east-west and 30 m north-south.

Previous Investigations

The site was reported in 1986 by personnel from the U.S. Army Corps of Engineers. A buried burned rock feature and several pieces of lithic debris were observed eroding from the east bank of Isle du Bois Creek. Recommendations were made for testing.

Testing Summary

Testing was done by UNT in 1987. This work included excavation of two backhoe trenches and five 1x1 m test pits (Figure 14.1). Test Pits 1 and 2 were excavated to depths of 90 cm bs and 80 cm bs, respectively while Test Pits 3 and 5 were excavated to depths of 40 cm bs and 50 cm bs, respectively. Test Pit 4 was placed above the buried rock feature observed in the eroded bank and was excavated to a depth of 120 cm bs. The hearth (Feature 1) occurred at a depth of 60-100 cm bs. Additional shovel tests were excavated to help delimit the site boundary. Results indicated the west part of the site was buried beneath a natural levee of Isle du Bois Creek. The levee had protected the cultural deposits from surficial disturbances. Cultural remains found further from the bank of Isle du Bois Creek were immediately below and/or within the plowzone. Following testing, recommendations were made for excavation.

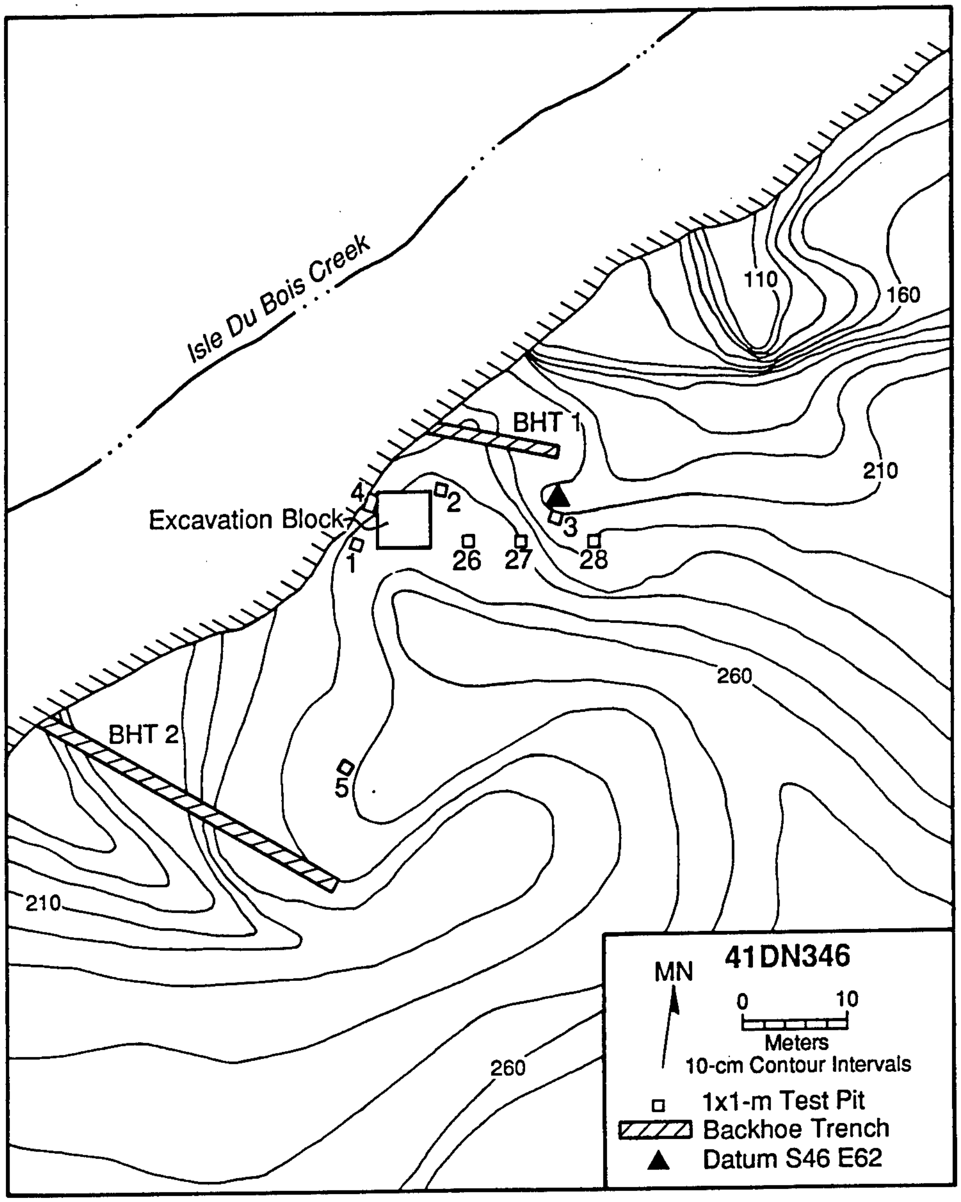


Figure 14.1 Map of Site 41DN346 showing excavations.

SITE SETTING AND GEOLOGY

Geomorphology

The Randy Site is situated on the first terrace of Isle du Bois Creek, on the east side of the channel (Figure 14.1). This is a Denton Creek Terrace of Isle du Bois Creek (Ferring 1993). Another Denton Creek Terrace is several meters higher, and occurs east of the site area. Still farther east is the Hickory Creek Terrace, at an elevation of ca. 15 m. above the stream channel; a section was described in that terrace at Locality 455A (see Chapter 6). The terrace associated with the site is quite broad in this part of the valley, and is matched on the west side of the creek. In the site area, this terrace has been moderately dissected; shallow

Table 14.1 Soil Profile Description
PROFILE DN346, TRENCH 2

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY
O	0-2	litter layer				
A	2-10	10YR2/2	SL	gr	n rctn	cs
A2	10-32	7.5YR3/2	LS	wf sab	n rctn	ci
2Ab	32-67	10YR2/2	SL	mf sab	n rctn	c bio
2Btb	67-84	5YR3/4	SCL	mc sab	n rctn	cs
2Bt2b	84-105	2.5YR3/6	SCL	wc pr> mc sab	n rctn	cs
2Bt3b	105-140	3.75YR4/6	SCL	wc pr> wc sab	n rctn	ds
2Cb	140-185	5YR4/6	SL	ms	n rctn	ds
2C2b	185-230+	7.5YR4/6	mLS	ms	n rctn	base

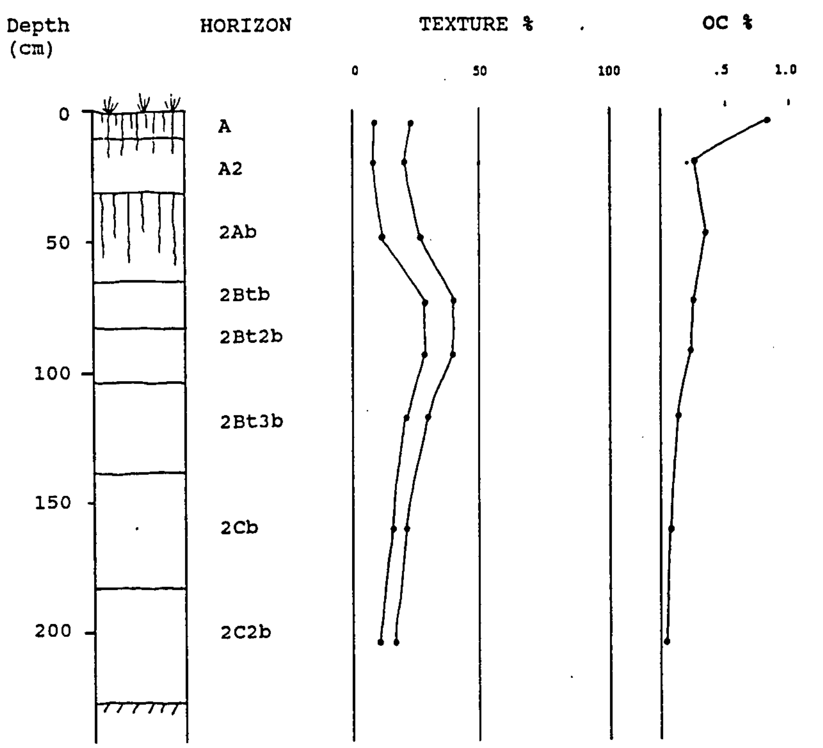


Figure 14.2 Soil Profile of 41DN346, Trench 1.

Table 14.2 Soil Profile Description
PROFILE DN346, BLOCK 1

HORIZON	DEPTH	COLOR	TEXTURE	STRUCT	BNDY	COMMENTS[a]
A	0-28	7.5YR3/2	LS	wm sab	cs	
2Ab	28-52	7.5YR3/2	grSL	mm sab	cs	common arts, charcoal
2A2b	52-77	7.5YR3/2	grSL	wm sab	gs	common FCR, charcoal, arts
2A3b	77-90	7.5YR3/4	SL	wf sab	gi[b]	few FCR
2ABb	90-106	5YR3/4	grSCL	mm sab	cs	
2Btb	106-150+	5YR4/6	grSCL	wm sab	base	

[a] no raction to HCl in any horizons
[b] NB: contact with B-horizon dips to NW in block area

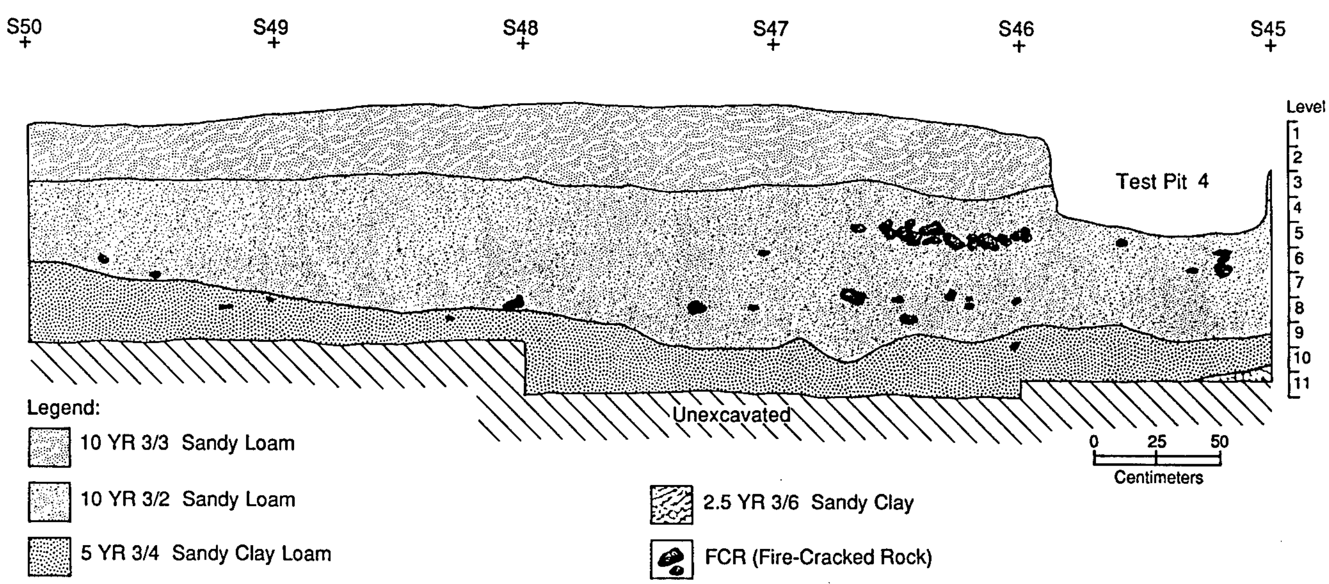


Figure 14.3 Profile of west wall, Block 1, 41DN346.

gullies are present to the north and south of the excavation block (Figure 14.1), and the block is situated at the southern slope of the northern gully. Once erosion had penetrated the soil B-horizon (described below) removal of the underlying Pleistocene sands must have proceeded quite rapidly. The soils stratigraphy suggests that the Isle du Bois Creek channel had recently shifted to the site area, and at the time of discovery was actively eroding the site.

Stratigraphy-Soils

Backhoe trenching in the site area revealed the Carrollton alluvium, the fill of the terrace. In Trench 1, ca. 2 m of this fill was exposed. Not shown in that profile are gravels that are at the base of the fill and presumably overlie Cretaceous bedrock. The soil in the upper part of the Carrollton alluvium is buried by more recent alluvium (the A-A2 soil horizons formed in the younger sediments). The soil in the Carrollton alluvium is moderately developed. It has a moderately thick Bt horizon, with thick clay films, strong structure and rubification to 2.5YR in the 2Bt2b horizon. This soil compares with the late Pleistocene soil that underlies the Holocene sediments at Site 41DN99, farther up Isle du Bois Creek (see Chapter 13).

Comparison of the profiles in Trenches 1 and 2, Block 1 and the test pits, show that Block 1 sediments comprise colluvial and fluvial fill of a small, shallow gully incised into the Pleistocene alluvium. This can be seen by comparing the profiles of Trench 1 (Figure 14.2, Table 14.1) with that of Block 1 (Figure 14.3; Table 14.2). The sediments covering the buried B horizon of the Pleistocene soil are ca. 1 m thick in the block area, but on ca. 35 cm thick on the more intact Pleistocene terrace in Trench 1. Features and stratified artifacts in Block 1 indicate that the younger sediments accumulated in the late Holocene, but that the depositional environment for archaeological stratification was complicated by colluvial movement of materials, and by the sloped paleosurfaces in the block area. The paleosurfaces cannot be seen in profile, but are inferred from the slope of the truncated B-horizon.

In the test pits to the east of the block, the A-horizon was all in the plowzone. In Test Pit 26 (Figure 14.1), the plow zone was ca. 25 cm thick. Artifacts had a peak (modal) density of 1130/m^3 in level 3 (20-30 cm bs) in that pit, and had a normally distributed density curve above and below that. As shown later, this density is almost ten times the highest artifact density in the excavation block, and is indicative of the stable land surface in that part of the site. In Test Pit 27, the modal density of debitage (470/m^3) was in level 2 (10-20 cm bs). Only 14 pieces of debitage were recovered from Test Pit 28, although the surface of this pit is somewhat lower than the others.

Following occupation, this site was buried by sandy alluvium, and a weak soil has formed in that parent material. This younger soil is essentially welded to the late Pleistocene soil; in the area of Block 1, the colluvial/alluvial sands are quite monotonous above the Bt horizon, and are coarser than in the sediments of Trench 1. The two soil A horizons in the block area are difficult to distinguish because of higher organic content and apparently higher bioturbation.

Geochronology

A radiocarbon age of 474 +/- 100 yr BP (Beta-32984) was determined on a charcoal sample from level 6 (ca. 60 cm below surface, and ca. 30 cm below the surface of the buried late Holocene soil) of the burned rock-lined hearth (Feature 1). This age does not appear congruent with the principal late Prehistoric component at the site. Because Feature 1 appears to have been excavated into the older sediments, this age should be younger than the sediments of equal depth away from the feature area; thus the radiocarbon age may be erroneous or pertain only to the latest occupations at the site. Also, the sloped aspect of the sediments (trending from SE to NW in the block area) has resulted in collapsed lithostratigraphy in an upslope direction, on the relict terrace surface.

Archaeological Contexts

Test excavations showed that the deepest deposits and deepest apparent cultural stratigraphy was in the area of Block 1, and this is where major excavations were located. Shallow deposits, on the terrace surface and in the plowzone yielded higher artifact densities, yet no chance for stratigraphic segregation of assemblages was indicated. Even with greater depth and features, the context for site formation in the area of Block 1 is not that good, since colluvial reworking of artifacts from the terrace surface as well as cultural and natural disturbance are indicated. The deep feature in Block 1 is an apparent hearth area dating to the late Prehistoric period. Construction of this feature undoubtedly disturbed and redeposited artifacts from earlier occupations. Overall, based on sediments, soils, artifact assemblages and the single radiocarbon age, it is clear the sediments at the site accumulated episodically in the late Holocene, and, after the last Prehistoric occupation a soil formed in the late Holocene sediments prior to recent burial. It appears that colluvial deposition was as important if not more important than alluvial deposition, and that artifacts were probably redeposited from terrace positions east and southeast of the Block 1 area. In the Block 1 area, the late Holocene sediments thin from northwest to southeast. The overlying levee deposits thin in the same way, such that levels 1-3 in the eastern part of the block are essentially part of the plowzone, but are comprised of recent sediments in the western part of the block. This undoubtedly contributes to the apparent mixture of Late Archaic and Late Prehistoric materials in the sequence of artificial excavation levels.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Methods

Excavations, conducted in 1987, were concentrated in Block 1, which measured 5x5 m, and also three 1x1 m test pits (Figure 14.1). Two new burned rock features were found and more of Feature 1, partially excavated in Test Pit 4, was exposed. A large quantity of cultural material, consisting of lithic debitage, tools, ceramics, and bone, was recovered. Three 1x1 m test pits (26, 27, and 28) were dug in a transect to the east of Block 1. Results indicated that deeper cultural deposits were confined to the area of the natural levee while cultural remains east of the levee were within the plowzone and/or at the surface of the soil B-horizon.

Features

Three features were found in Block 1. Feature 1, a concentration of burned rock that had been partially excavated during the testing phase, continued into the northwest corner of the block. Feature 1 was first recognized at the top of level 6 and continued into level 10. The burned rock was primarily limestone with a few pieces of sandstone. The feature measured 3.0 x 1.75 m in area with a maximum depth of 50 cm (Figure 14.3). Very little charcoal or staining was associated with the feature. It appears to be a rock-filled hearth or roasting pit. Charcoal from level 6 yielded the radiocarbon age of 474 +/- 100 years BP mentioned previously.

Feature 2 was a small cluster of burned rock, and was first encountered at the bottom of level 6 and continued into level 7 in Block 1. The feature measured 80 x 80 cm in diameter with a depth of 15cm. A darker stain occurred with the burned rock but very little charcoal was associated with it.

Feature 3, a dark stain that extended into the B-horizon, measured 64 x 52 cm in area and had a maximum depth of 13 cm. The feature was first recognized near the bottom of level 8 and it extended into level 9. The pit was basin-shaped and contained a carnivore mandible. Very little cultural material was associated with it.

Artifact Assemblages

A total of over 6,300 lithic artifacts were recovered from Block 1 (Table 14.3). A substantial part of this number is from a single fine-screened unit, which yielded numerous small pieces of debitage (compare figures in Table 14.3, 14.4). Almost 98% of the artifacts are debitage. Among the other artifact classes, projectile points

Table 14.3 ASSEMBLAGE COMPOSITION, DN346

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	GRND ST	N	SHERDS
1	13	1						
2	696		4		9		709	5
3	1354		11		19	1	1385	5
4	1151		8	2	15		1176	2
5	975	1	7		15		998	
6	903	3	4	1	14		925	
7	753		4	1	7		765	
8	407		2		3		412	
9	277	1	5	2	3		288	
10	118		2		1		121	
11	59		2			1	62	
12	12		1				13	
TOTAL	6239	4	40	4	82	1	6370	
%	97.94	0.06	0.63	0.06	1.29	0.02		

Table 14.4 DEBITAGE, DN346

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
1	33	14	8	13	7	3	3	0	81	16.05	37.04	29.63
2	59	32	22	36	12	1	0	3	165	9.70	43.64	36.97
3	106	32	56	49	15	3	10	0	271	10.33	31.00	42.44
4	73	11	32	20	13	3	6	2	160	15.00	22.50	37.50
5	45	19	18	20	11	2	1	0	116	12.07	35.34	33.62
6	61	22	11	7	13	1	2	1	118	14.41	26.27	17.80
7	46	27	14	12	5	0	1	0	105	5.71	37.14	25.71
8	36	22	14	18	8	0	1	0	99	9.09	40.40	33.33
9	0	0	1	1	0	0	0	0	2	0.00	50.00	100.00
10	14	7	4	2	1	0	0	0	28	3.57	32.14	21.43
11	3	6	1	6	5	0	0	0	21	23.81	57.14	33.33
12	2	1	0	0	0	0	0	0	3	0.00	33.33	0.00

and blank-preforms are most common. For the size of the assemblage, the small number of cores is evident, as is the paucity of groundstone.

Technology-Raw Material Use

Debitage classification (Table 14.4) and artifact classes (Table 14.5) show that production of bifaces dominated lithic reduction activities. Few flake cores were found throughout the levels; three of these, from level 6, are opposed platform cores. Blank-preforms however, are about half as common as projectile points. It is significant that all of the 40 blank-preforms and all of the cores are made of Ogallala quartzite, while a substantial portion of the arrow points and dart points are made of regional chert (Tables 14.5, 14.6). Of the blank-preforms, only four (one each from levels 3-6) are arrow point preforms, the rest being in the dart point size range. The raw material distributions indicate procurement of local quartzite for on-site manufacture, and probable importation of finished tools made of regional chert; alternatively, regional chert preforms may have been imported, but hypothetically, all would have to have been successfully finished into tools. Despite problems of bioturbation and possible paleoslopes that cannot be defined startigraphically, chert appears to be more common in levels 1-6.

Within the debitage sample (Table 14.4), low amounts of chert and moderate amounts of cortical pieces are present throughout the assemblage. Samples below level 8 are inadequate to determine patterning. Of the chert debitage, small interior pieces are dominant, suggesting tool repair or resharpening; the few cortical chert pieces exhibit stream cobble cortex, and may have been derived from preforms that are not present in the sample (ie., they may have been reduced to completed tools, or were simply not present in the excavated area). Overall, this assemblage is dominated by projectile points and blank-preforms. Little on-site production of debitage blanks is suggested, and few unifacial tools were either made or imported to the site. For all occupations, therefore, maintenance of imported projectiles and manufacture of projectiles from local quartzite dominated lithic processing activities. Based on tool types (Tables 14.5, 14.6), hunting activities appear to have been the most common focus of lithic processing here.

Typology

Lithic tools are clearly dominated by projectile points (Tables 14.5, 14.6; Figure 14.4). These are about evenly divided between arrow points and dart points. Over half of the arrow points are Scallorn and over half of the dart points are Gary types. Of the latter, half of the ones from upper levels are made from chert whereas all the ones from lower levels are made of quartzite. Together, these two types suggest that the principal occupations of the site date to the last part of the Late Archaic and the early part of the Late Prehistoric; this is a weak conclusion however, since both older and younger artifacts are common. Fresno, Washita, Alba, Bonham and Toyah points appear to represent the latest occupations, associated with small numbers of Nocona Plain sherds. Earlier occupations, dating to the Late Archaic are represented by the expanding stemmed and notched dart point types, especially Godley, Edgewood, Ellis and Yarborough. These overlap vertically with Gary points as well as arrow points, and no clear-cut cultural stratigraphic break could be defined. Clearly, the projectile point assemblage suggests many reoccupations over a considerable part of the late Holocene.

Unifacial tools are limited in number and type (Table 14.5). Only the chert bifacial drill is suggestive of a Late Prehistoric affinity; the rest are non-diagnostic forms. Groundstone tools include one unifacial mano that is otherwise unprepared. From level 11 is a ground hematite "gorget" or chisel. This piece is ovate, and measures 62 x 41 mm and 7 mm thick; it is finely ground and polished over its whole surface. All edges are rounded except one narrow end, which has been ground to a sharp edge. If it had been perforated, it would be a classified as a gorget. The thin, sharpened edge suggests a functional morphology (as opposed to decorative), but no clear classification is evident.

Table 14.5 ARTIFACT TYPOLOGY- 41DN346
(x/x = chert/quartzite)

CLASS/Type	LEVEL 1	2	3	4	5	6	7	8	9	10	11	12
BIFACES												
Arrow point		3/2*	2/3	5/2	-/6	2/4	1/1					
Dart point		2/2	2/12	3/5	2/7	4/4	2/3	2/1	-/3	-/1		
UNIFACES												
Perferator				1/-								
Bifacial drill						1/-						
Retouch, unilateral				-/1					1/-			
Notched piece							1/-					
Double burin on biface									1/-			
BLANKS												
Blank-preform		-/2	-/5	-/4	-/7	-/4	-/4	-/1	-/4	-/2	-/2	-/1
Biface fragment		2/-	2/3	1/3				-/1	-/1			
CORES												
Mult plat flake									-/1			
Opp plat flake						-/3						
Core fragment	-/1				-/1							
GROUND STONE												
Mano, unifacial				1								
Hematite pendant											1	
Total	1	13	31	25	23	22	12	5	11	3	3	1
Pct chert, chipped stone	0	46	39	48	9	27	33	40	18	0	0	0

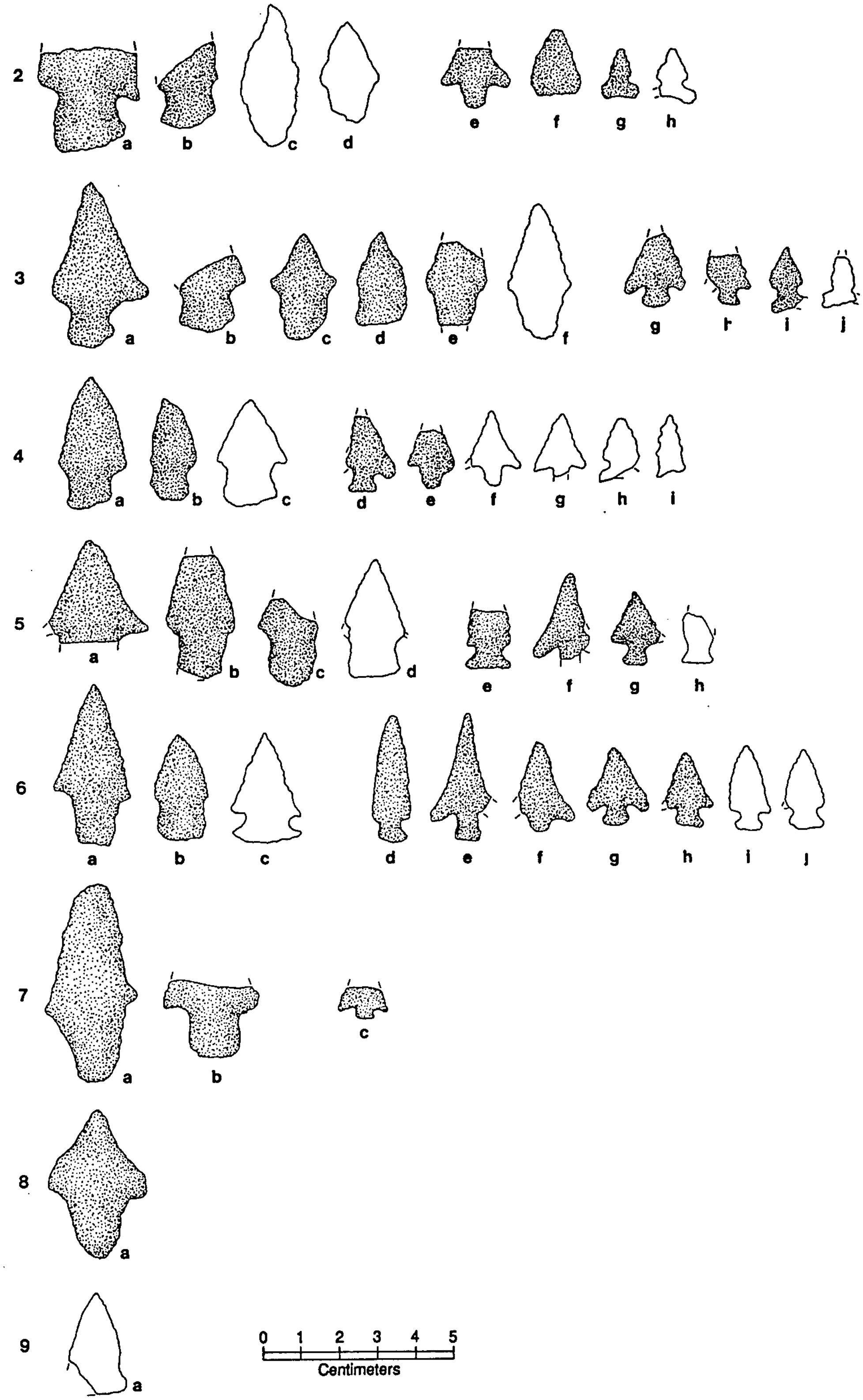


Figure 14.4 Projectile points from 41DN346, Block 1.

Table 14.6 PROJECTILE POINT TYPOLOGY- 41DN346
(x/x = chert/quartzite)

CLASS/Type				L	E	V	E	L	
	2	3	4	5	6	7	8	9	10
ARROW POINTS									
Fresno	-/1								
Washita	2/1	-/1	1/-						
Alba	-/1					-/1			
Bonham			-/1						
Colbert				-/1	-/2				
Toyah		2/-							
Perdiz			1/-						
Scallorn		1/1	1/1	-/4	2/2				
Indeterminate	1/-	-/1	1/-	-/1		1/-			
DART POINTS									
Gary	2/-	1/3		-/3	-/2	-/2	-/1		
Godley	-/1	-/1							
Elam		-/1							
Edgewood			1/2					-/1	
Ellis					1/-				
Yarborough	-/1			1/1	-/1				
Langtry						-/1			
Indeterminate		1/6	2/3	1/3	3/1	2/-	2/-	-/2	-/1
Total	9	19	15	15	14	7	3	3	1
Pct chert									
Arrow points	40	40	71	0	33	50			
Dart points	50	14	38	22	50	40	67	0	0

Table 14.7 ARTIFACT DENSITIES, DN346, BLOCK 1

level	% burned	debden (n/m3)	artden (n/m3)	boneden (n/m3)	mussden (gm/m3)	rockden (gm/m3)
1	100.00	162.00	164.00	2.00	0.00	74.0
2	71.43	68.75	70.42	2.92	0.00	984.2
3	26.84	112.92	117.50	10.42	0.04	1500.8
4	31.74	66.67	70.83	40.00	0.00	1038.8
5	33.23	48.33	51.67	46.25	0.00	292.1
6	33.67	49.17	52.50	172.92	0.00	22226.7
7	40.19	43.75	45.83	78.33	0.00	14861.7
8	47.66	41.25	42.08	85.83	0.00	11526.7
9	46.34	1.43	7.14	58.57	0.00	18983.6
10	51.22	28.00	30.00	81.00	0.00	14656.0
11	35.8	35.00	38.33	111.67	0.00	2795.0
12	22.39	15.00	20.00	0.00	0.00	370.0
Mean	45.04	56.02	59.19	57.49	0.00	7442.5
Std Dev	20.74	41.94	41.58	50.05	0.01	8013.5

Ceramics

Only 12 sherds were recovered. These are all from levels 2-4 (Table 14.3). All of these are small, thin body sherds of shell-tempered Nocona Plain that have smooth, interior and exterior surfaces. Most exhibit leaching of the shell temper.

ZOOARCHAEOLOGY

A total of 1,866 bones were recovered from 41DN346. Of this total 17% were identifiable, and 42% exhibited burning. Table 14.8 provides a list of identified taxa found in each level of Block 1 and from test units (TU). The composition of animals in this sample indicates that the occupants availed themselves of aquatic (fish, kinosternid turtles, and beaver), as well as grassland (jack rabbit, pronghorn, and bison) and woodland edge (box turtle, cottontail, and deer) habitats for securing game.

The burned bone is proportionate to the vertical distribution of total bone (Figure 14.5), being greatest in frequency in level 7. Horizontally, the burned bone is scattered over Block 1 and is not particularly concentrated near the cluster of FCR near Test Pit 4 (Figure 14.1). Turtle shell fragments are the most numerous identified taxa in the burned bone sample, with deer second in frequency; a couple of rabbit and medium mammal bones, and one fish vertebra also were burned. Turtle shells may have been used as cooking vessels; regardless, turtles were clearly being processed in some numbers here.

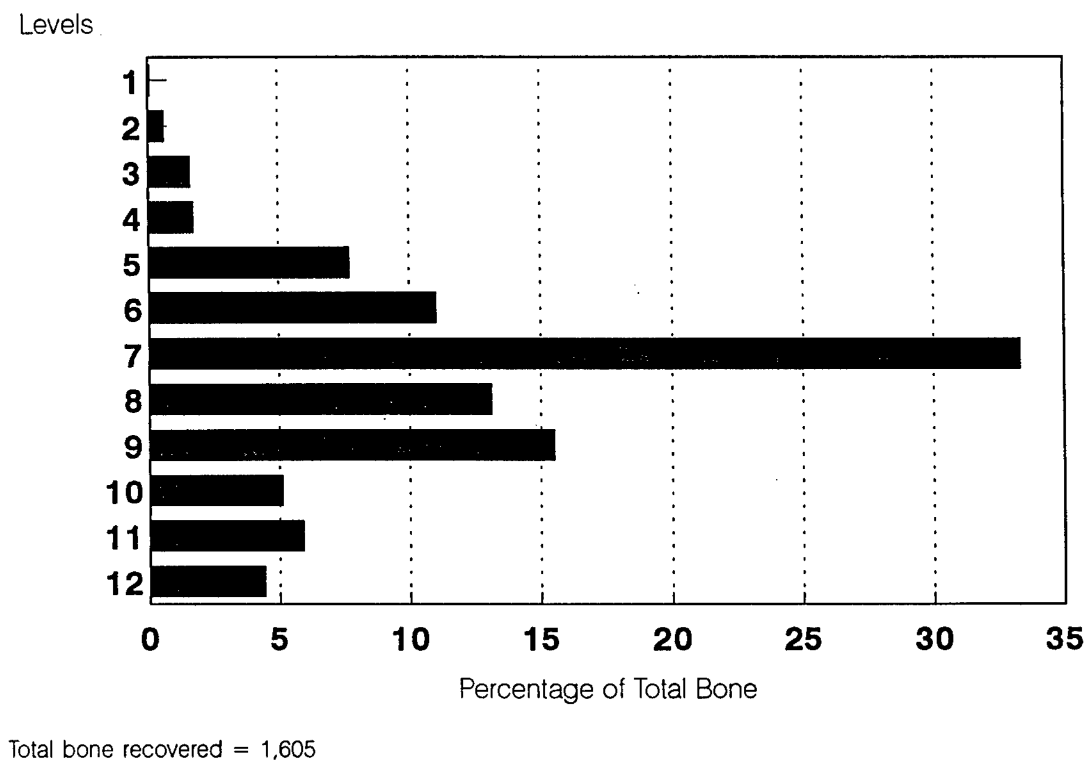


Figure 14.5 Total bone recovered per level, 41DN346.

Table 14.8 SPECIES LIST, 41DN346

Taxon	levels											
	1	2	3	4	5	6	7	8	9	10	11+	TU
Catfish											1	
Indet. Fish						2	1					
Musk/Mud Turtle				1		2		1			1	
Box Turtle						4	7	1	1		1	
Indet. Turtle	1		1	3	3	27	16	17	7	6	35	
Indet. Snake						1						
Armadillo		1										
Cottontail						1	1				2	
Jack Rabbit								1				
Beaver							1					
Pocket Gopher 1		4	1			1		2		2	1	
Carnivore									5			
Deer		1			3	5	4	8	1	6	5	10
Pronghorn												1
Deer/Pronghorn				1		2	8	10	13	4	4	6
cf. Bison		2							3			1
Indet. Mammal, sm											4	
Indet. Mammal, med							1	3				
Indet. Mammal, lg	4	5	4	21		7		15				
Unidentified 1	9	25	28	128	177	535	210	249	82	95	70	

As in other Ray Roberts sites of this size or larger, deer bone provides the most abundant evidence of large game even though bison is tentatively identified from five tooth enamel fragments and a sesamoid. And while most of the elements assigned to the large mammal category are deer-size, a few thick bone wall fragments may also be from animals the size bison or elk. Nevertheless, it is clear that bison was not encountered close enough or frequently enough to have been brought back with any frequency and butchered on site. The deer elements, on the other hand, indicate whole carcasses were propcessed on-site. Many of the deer bones are burned, but no cut marks were noted.

Taphonomically, the faunal remains are well preserved, suggesting that most faunal materials pertain to later occupations of the site. The most common surficial damage was caused by rodent and carnivore gnawing, primarily on the deer remains. Abrasion marks were also noted, possibly caused by trampling, but very few bones exhibit heavy weathering scars, such as long, deep cracks or large patches of exfoliation.

In summary, these taphonomic data suggest that the faunal remains were scattered either by scavengers or by trampling (or both) and were probably covered fairly rapidly, thus enhancing their preservation. Subsistence focused on deer and turtle, with occasional procurement of small and medium-size mammals. Bison is tentatively identified by tooth fragments in levels 2 and 9; and the failure to recover post-cranial remains of bison may be attributed to sampling.

SUMMARY

The Randy Site has a stratified record of Late Archaic and Late Prehistoric occupations. Paleoslope enhanced the apparent mixing among these archaeological deposits, as has pedogenesis, bioturbation and results of serial occupations. Faunal material is not common above level 5, but this is in part a result of sloping occupation surfaces. The highest faunal densities correspond with the Late Archaic/Late Prehistoric transition zones, with Gary and Scallorn projectile points and lacking ceramics. Scant bison remains (tooth enamel only) occur above and below this zone, with the majority of the faunas showing use of resources from the nearby site setting. Biface manufacture in all occupations involved use of local quartzites, while projectile points and unifacial tools were made more commonly on chert blanks. The 12 sherds of Nocona Plain pottery are attributed to the latest occupations at the site. No architectural features were found, but three hearths, including one large rock-lined roasting pit were revealed in the 25 sq m block.

CHAPTER 15
THE VAUGHANTOWN SITE (41DN79)

INTRODUCTION

This site is located on a low Pleistocene terrace along the Elm Fork of the Trinity River, west of the confluence with Isle du Bois Creek (Figure 15.1). It was characterized by a moderate surface scatter of lithic debris, fire-cracked rock, and historic artifacts in a cultivated field (Skinner et al. 1982b:3-5)

Previous Investigations

Testing was conducted at 41DN79 by ECI in 1981. During this testing, eight auger holes were excavated to recover information on subsurface geology and to guide the placement of test units. Two 1x1 m units were dug, and Test Unit 2 revealed stains described as possible postmolds. The unit was enlarged using a series of nine 1x1 m units to expose the "postmold" pattern.

Based on the testing results, the site was interpreted as representing a seasonal camp occupied by a macroband that practiced broad-ranged subsistence. The site was determined eligible for nomination to the National Register of Historic Places, and excavations were conducted in 1982 (Skinner and Baird 1985:4-5).

Eleven 2x2 m units were dug in the vicinity of Unit 2 to examine further the possibility of a house location in this area. These units were later defined as a block 8x8 m in size. Fourteen randomly placed 2x2 m units were also excavated to recover a larger artifact sample (Figure 15.2). Several postmolds were reported in Block 1 and were interpreted as reflecting the remains of three structures. A prehistoric artifact assemblage comprised primarily of lithic artifacts were recovered. Several historic assemblages were identified, including one reflecting a late nineteenth-century to early twentieth-century farmstead, and a possible eighteenth-century component containing gunflints and a piece of French faience pottery (Skinner and Baird 1985:4-15; Lebo

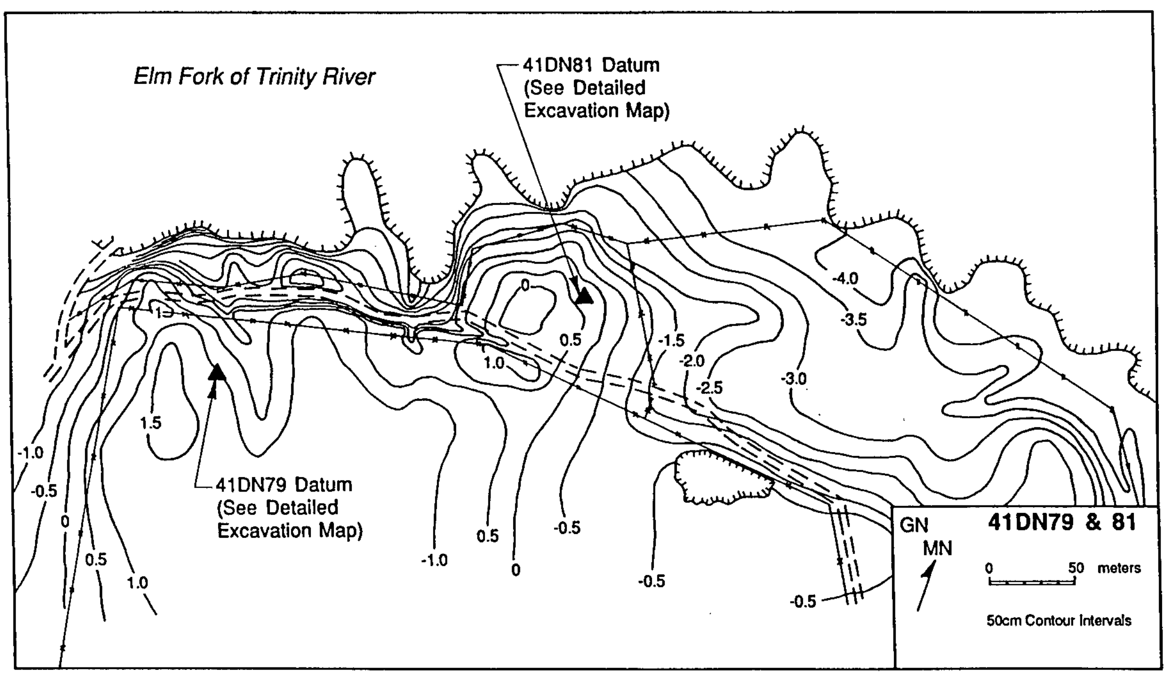


Figure 15.1 Topographic map with Sites 41DN79 and 41DN81.

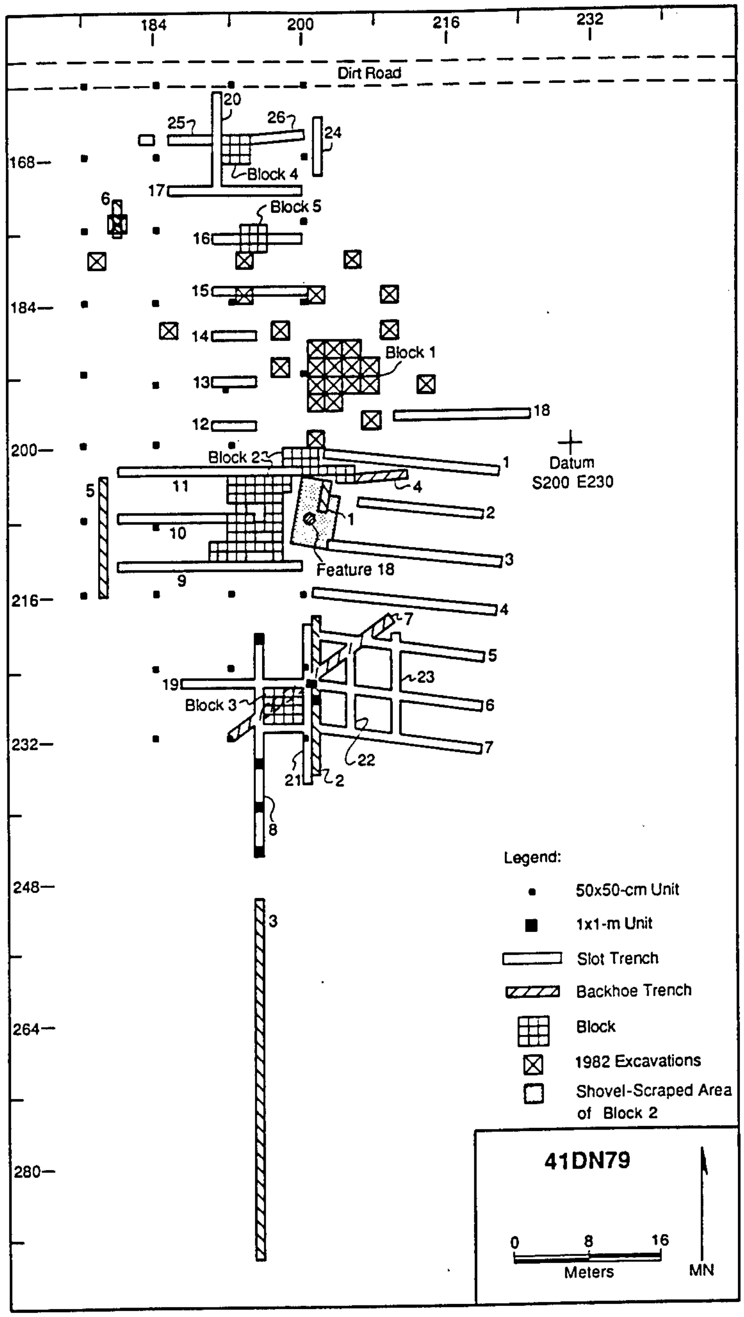


Figure 15.2 Map of the Vaughantown Site (41DN79), with excavation units.

1997). It could not be determined if the latter artifacts were associated with a historic Native American occupation. No additional work was recommended.

The site was revisited twice in 1986 by personnel from UNT, and three shovel test pits and one 1x1 m unit were excavated. A diffuse scatter of lithic debris and historic material was recovered. Lithic debris was recovered from two shovel test pits. Based on these results, further excavation of the prehistoric components was recommended.

SITE SETTING AND GEOLOGY

Geomorphology

Site 41DN79 is on the first terrace (a Denton Creek Terrace) of the Elm Fork Trinity River. In the site area the terrace is ca. 6 m above the floodplain. The site is near the northern edge of the terrace and overlooks a slough that appears to be an abandoned Holocene channel of the Elm Fork of the Trinity River. The site topography is generally level, but there is a gradual slope to the north towards the terrace scarp, and gentle gullies drain towards the scarp as well. Gully erosion of the terrace probably was accomplished during the Holocene. West of the site is a large gully which was dammed to form a stock pond. Overall, however, the site surface is generally level up to the northern perimeter near the terrace scarp. The terrace is quite broad, and extends ca. 600 m south to the scarp of the Hickory Creek Terrace. Trenching of the terrace between the site and the Hickory Creek terrace scarp revealed alluvial deposits that fine away from the site. Southeast of the site are several old gravel pits, excavated where Pleistocene gravel is near the surface. Soils data suggest that the terrace surface has been relatively stable since the late Pleistocene, and was probably impacted by land clearing and plowing in the post-settlement period. This site is essentially in the same geologic position as site 41DN81 located several hundred meters to the east.

Stratigraphy-Soils

The terrace fill is part of the Late Pleistocene Carrollton Alluvium. This alluvium appears to be terrace fill rather than a cut into the higher Hickory Creek terrace which occurs south of the site. A profile at the southern end of Backhoe Trench 2 (Figure 15.3; Table 15.1) revealed late Pleistocene alluvium and the soil that has formed in this parent material. Carbonate cemented gravel are the deepest sediments exposed. These presumably overlie bedrock. Above the gravel is ca. 2.4 m of sandy alluvium (Figure 15.4). An Alfisol has formed in this alluvium. The A-horizon is about 15 cm thick and is underlain by an argillic B-horizon extending to a depth of approximately 1.9 m below surface. In the main site area, the vast majority of the artifacts are in the A-horizon or in the uppermost part of the B-horizon.

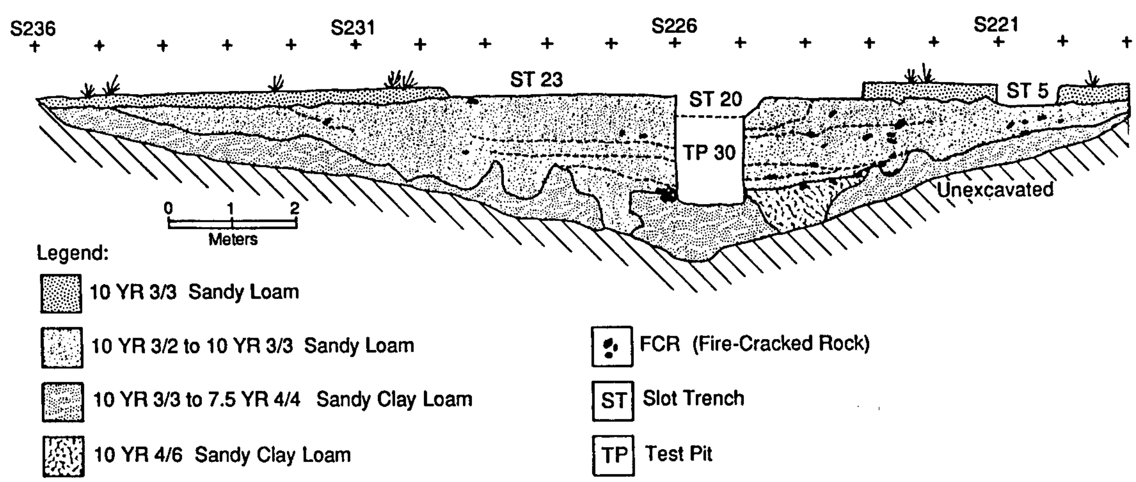


Figure 15.3 Geologic cross-section of Trench 2, 41DN79.

In the central site area, north of the Backhoe Trench 2 profile, is a large eroded depression which has filled with dark organic-rich loamy material. Although, numerous trenches were dug through this deposit, the exact geometry and geologic origin of this geologic feature could not be determined. The best, but admittedly weak, interpretation of this geologic feature is that it is an erosional gully which filled with A-horizon material

Table 15.1 Soil Profile Description
PROFILE DN79, TRENCH 2

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY	
Ap	0-8	7.5YR3/4	fSL	wf sab	n rctn	cs	
A	8-15	8.75YR3/4	fSL	mm ag	n rctn	as	
Bt	15-28	5YR3/4	fSCL	sm sab	n rctn	cs	
Btc	28-53	2.5YR3/6	fCL	sm sab	n rctn	cs	cf FeMn cc
Btc2	53-88	5YR4/6	fCL	mm pr> sm sab	n rctn	gs	cm FeMn cc
Bw	88-119	5YR5/7	fL	wm pr> mm sab	n rctn	gs	
BC	119-187	7.5YR5/8	SCL/L	wm pr>	n rctn	gs	csm 7.5YR5/4 mottles
C	187-224	7.5YR5/8	SL/SCL	mc sab	n rctn	ai	cmc 7.5YR5/8 mottles
2C2	224-325+	clast-supported pebble/cobble gravel;limestone and fossil clasts; violent reaction HCl; few thin to medium beds of massive coarse sand; common FeMn stains on clasts.					

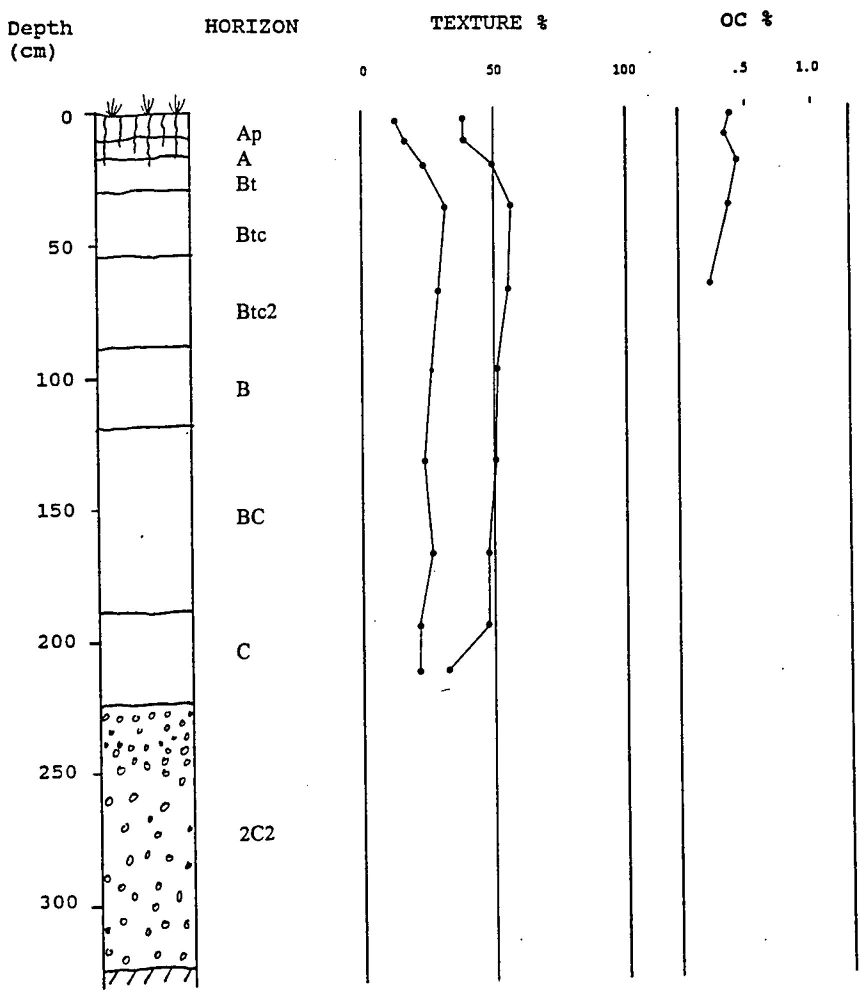


Figure 15.4 Profile at south end of Backhoe Trench 2, 41DN79.

probably in late Holocene time. The distribution of prehistoric and historic artifacts at this site should comment directly on the age of this geologic feature. Since historic artifacts are distributed evenly across the feature, and prehistoric artifacts are rare across this feature, it is presumed that the gully and the subsequent filling of the gully took place sometime in the late Holocene and prior to the principal historic occupation at the site. The extremely low density of prehistoric artifacts, and the absence of features in the fill of this depression argue against a cultural origin. The contact of the depression fill with the underlying Pleistocene deposits is irregular and highly bioturbated.

Table 15.2 Soil Profile Description
PROFILE DN79, BLOCK 4

HORIZON	DEPTH	COLOR	TEXT	STRUCT	CARB	BNDY	
A	0-5	7.5YR3/2	LS	wm sab	n rctn	ai	
A2	5-30	7.5YR4/4	L	wm sab	n rctn	ai	
2Aab	30-68	7.5YR2/0	L	wm sab	n rctn	ci	abundant FCR, charcoal, bone shell, artifacts
2Aa2kb	68-110	5YR3/4	fSL	wm sab	m fi	gs	FCR, charcoal, bone, shell, arts
2AaCkb	110-155	7.5YR4/4	SCL	wm sab	f fi	ai	
3C	155+	cemented pebble and cobble gravel					

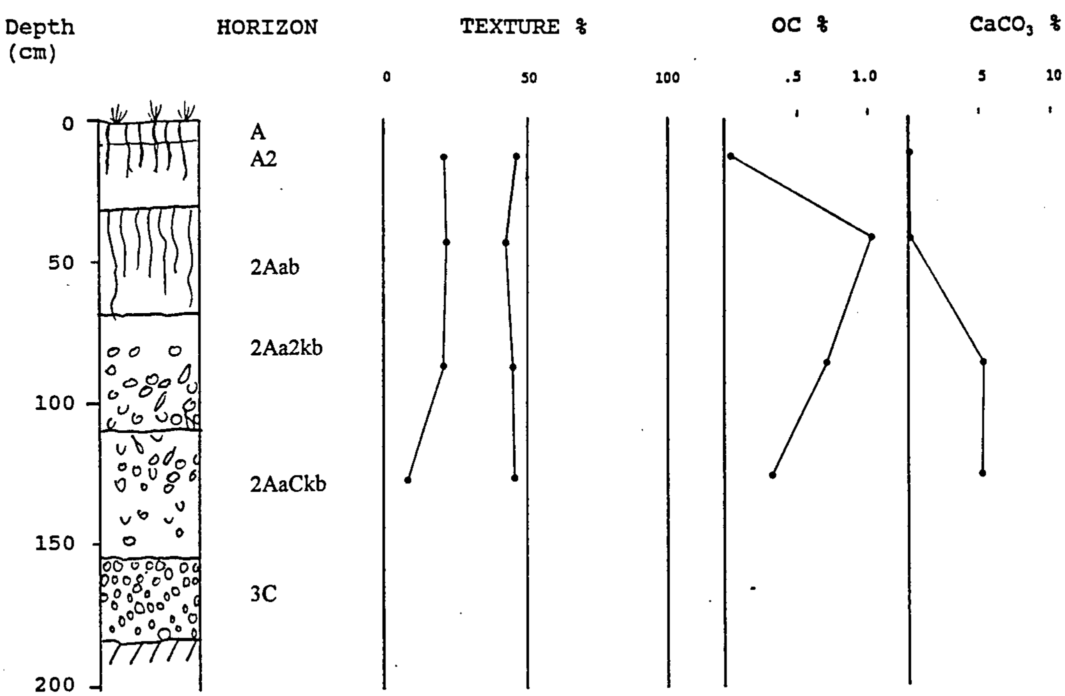


Figure 15.5 Profile of Block 4, Site 41DN79.

Colluvial sediments are present at the north edge of the terrace. These appear to have derived from slopewash off the terrace and down the terrace scarp. The upper section of these sediments contained stratified artifacts and features that were exposed in the roadcut along the terrace edge, and in excavations at Block 4 (Figures 15.2, 15.5).

Geochronology

Two radiocarbon ages were determined on charcoal samples from Block 4:

Lab. No.	Level	Radiocarbon Age BP (corrected)
Beta-32518	6	831 +/- 60
Beta-32519	9	953 +/- 80

These ages are in correct stratigraphic order and document deposition of sediment during the late Holocene. The contexts of the samples and archaeological materials is discussed below.

Archaeological Contexts

Three principal archaeological contexts are present. The first is the plowed surface of the terrace, with a thin soil A-horizon underlain by the clay-rich B-horizon. This was essentially a stable surface during the Holocene, where acid soils and relatively intensive bioturbation were probably present. This was a poor setting for site construction, and post-occupational disturbance by natural and cultural agents was probably significant. The second context was on the shoulder of the terrace scarp, in the vicinity of Block 4. There, colluvial deposition took place at least during the Late Holocene, providing a setting for burial of archaeological features and artifacts. The third setting is associated with the depression filled with late Holocene sediment (Feature 1). Genesis of this feature and the mechanisms of filling are not well understood. It appears to have been a natural depression that collected sediment by surface erosion and sheet wash, accompanied by quite intense bioturbation. In this sense the feature is analogous to the pit at the Cobb Pool Site at Joe Pool Lake (Peter and McGregor, 1988).

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Methods

Excavation of the prehistoric component(s) was requested in the Scope of Work and was conducted in 1987. This work included the excavation of three backhoe trenches, 26 hand-dug slot trenches, four blocks, and a shovel-scraped area in Block 2. The backhoe trenches were excavated to delimit site boundaries and the depth of cultural deposits. Block 1 is that excavated by ECI. The A-horizon was shallow, and the slot trenches were dug to expose undisturbed deposits below the plowzone. These slot trenches were hand excavated, and the sediment was not screened. Artifacts found during shoveling or in the backdirt were collected. Three blocks (Blocks 3-5) of contiguous 1x1 m units were dug to acquire samples of prehistoric cultural material. Block 2 was excavated in the same fashion as the slot trenches. The plowzone was removed, and undisturbed deposits were exposed. Block 1, excavated by ECI was relocated at the beginning of the season, and was used to establish a grid that was tied into the previous excavations. The shovel-scraped area in Block 2 was hand shoveled to expose subsurface features below the plowzone near Feature 18.

Excavation of slot trenches revealed several features immediately below the plowzone. Two larger soil stains were revealed in the northern and southern peripheries of the site, respectively. On the basis of slot Trenches 5, 6, 7, 8, 21, 22, and 23 the irregularly shaped circular stain at the south end of the site measured about 17x17 m in area. Block 3 was established within the westernmost part of the stain and measured 4x4 m.

Backhoe Trench 2 was dug to bisect the stain in a north-south direction, and Backhoe Trench 7 crossed it from southwest to northeast (Figure 15.2). These trenches indicated that the dark stain had an irregular basin-shaped bottom that extended to a depth exceeding 2 m. Hand excavation of 1x1 m units adjacent to Trench 2 indicated a very diffuse fire-cracked rock scatter and little other cultural material. Consequently, only the upper levels were excavated in Block 3 (at the south end of site). No evidence was recovered which indicates this filled depression is a cultural feature.

Based on Slot Trenches 17, 20, 24, 25, and 26, the dark soil area at the north end of the site was estimated to be approximately 11 m east-west by 13 m north-south. Block 4 was established within the eastern part of the dark soil area. It measured 3x3 m and was excavated to basal cemented gravel deposits. The colluvial-midden deposits contained several rock-lined hearths, and prehistoric artifacts and faunas; this appears to be the only part of the site where sediments have escaped serious disturbance in the post-settlement period. Block 2 was established between Blocks 1 and 3. The plowzone was manually stripped off, and Feature 18 was exposed. It was a small, oval-shaped pit containing a large quantity of historic domestic debris (ceramic, glass, personal items) and a small number of prehistoric lithic debris and bifaces. Block 5, 3x3 m in size, was placed between Blocks 1 and 4.

Based on the results of Trench 1 and Slot Trenches 1, 2, 3, 9, 10, and 11, Block 2 was dug to obtain spatial data on Feature 10, a trash-filled storage pit exposed in Backhoe Trench 1. Shovel scraping was used to remove the plowzone near Feature 10 and resulted in exposing Features 18 and 19. The fill of Feature 18 was piece-plotted. Feature 19 is an oval-shaped stain, possibly related to hearth-cleaning activity in this area of the site.

Cultural Stratigraphy

Features

Nineteen features were found during the 1987 excavations. Historic artifacts were found in Features 1, 2, 8, 17, and 18, and are discussed in detail by Lebo (1997). Features relating to the prehistoric occupations are described below.

Units in Block 3, and parts of Slot Trenches 6, 8, 19, 21, and 22, and several 50x50 cm and isolated 1x1 m units were located in Feature 1 (Figure 15.2). Following the excavation of these units, Backhoe Trenches 2 and 7 were dug and profiled to determine the function of Feature 1. The west wall of Backhoe Trench 2 is shown in Figure 15.. Based on these results, Feature 1 was identified as a geological feature, probably a filled gully. Historic artifacts were found in the upper levels of the 50x50-cm units, Block 3, and the backhoe trenches excavated in Feature 1.

Feature 2 was identified as a prehistoric midden containing rock-lined hearths and cultural debris (charcoal, ash, burned clay, bone, lithics, and fire-cracked rock [FCR]). It was located at the north end of the site and is approximately 13 m by 17 m by 1 m deep. The feature was exposed below the plowzone at the base of Level 3. Several plow scars were evident at the contact between the plowzone and the underlying deposits. The feature was excavated in Units 17 and 22-29 in Block 4.

Two discrete features were identified within Feature 2, Feature 6 and Feature 16, as dense fire-cracked rock concentrations (see discussion below). Feature 2 was dug in arbitrary 10-cm levels. With the exception of Unit 25 and Feature 6, the matrix from Feature 2 was waterscreened through 1/4-inch mesh. Fill from Feature 6 and from Unit 25 was waterscreened through 1/16-inch mesh.

Feature 3 was a dark organic stain in Unit 6 (S227.41 E197.42) of Block 3. It was identified in Level 2 and extended into Level 4. It was approximately 21 cm in diameter and contained fire-cracked rock and charcoal. No artifacts were found. It is unknown whether the feature was associated with the historic component(s) or the prehistoric occupations at this site.

Feature 4 was a dark organic stain, possibly a postmold, in Unit 1 (S226.95 E196.72) of Block 3. It was identified at the base of Level 3 while trowelling the floor of Level 3. It was approximately 14 cm north-south by 20 cm east-west. It was not excavated.

Feature 5 was a possible postmold identified by a dark stain at the base of Level 3 in Unit 1 (S226.49 E196.14) of Block 3. It was not excavated. It was approximately 16 cm by 18 cm in diameter. The age and association of this feature is unknown. It occurred in the same area as Features 3 and 4 and may be related to these features.

Feature 6 is a hearth within Feature 2. The feature was identified at the base of Level 3 and extended to the top of Level 8. It was excavated in Units 24, 25, 27, and 28 in Block 4. It was a basin-shaped feature containing stained matrix, charcoal, fire-cracked rock, bone, shell, and lithics. The feature was removed by unit level for finescreening. No historic artifacts were found in this feature.

Feature 7 was identified as an organic stain with two pieces of fire-cracked rock and small charcoal flecks at the base of the plowzone in Slot Trench 1 (S201.31 E207.69). It was approximately 57 cm x 54 cm with a maximum depth of 4 cm. No artifacts were found.

Feature 8 was an organic stain containing fire-cracked rock, daub, bison bone, deer antler, charcoal, and pebbles and one historic refined earthenware sherd. It was in Slot Trench 10 and was identified at the base of the plowzone. The feature was approximately 98 cm by 76 cm and extended to the base of Level 1 (0-10 cm below the plowzone). This feature may have been used as a storage pit.

Feature 10 is identified as a prehistoric storage pit. The maximum dimensions of the feature were 110 cm north-south by 65 cm east-west and 42 cm deep. The feature was exposed in BHT 1 (approximate center of the feature is S206.55 E203.32). This feature was basin-shaped, contains burned rocks, charcoal, prehistoric lithic debitage, bone, a side-notched arrowpoint, shell, and lithic debitage. The size and depth of Feature 10 suggests that it was used as a storage pit and later for trash disposal. Finescreen samples were taken for each level. No historic artifacts were found in Feature 10, although Feature 18, a historic trash-filled pit was located only 2 m southwest of Feature 10 in Block 2. The upper part of Feature 10, however, may also have been removed by historic plowing. Approximately 30-40% of this feature was removed by the backhoe.

Feature 11 was identified as a Y-shaped filled pit in Feature 1 (filled gully). It was in Slot Trench 23 (center of feature is S228.25 E209.75). The feature was 1.5 m north-south by 1.25 m east-west, and a plan view was drawn. It was then divided into two features, 11A and 11B. Feature 11A was bisected east-west and the north half was removed. The feature was shallow, approximately 8 cm thick, and contained a small amount of fire-cracked rock, charcoal, lithic debitage and bone. Feature 11B was bisected and the north half was excavated. It was identified as a disturbed rodent den impacted by plowing.

Feature 12 was a possible postmold in Slot Trench 23 (center: S229.95 E210). It was identified at the base of the plowzone and was probably truncated by plowing. The feature was about 13 cm in diameter, circular, only 16 cm in depth, and has a rounded bottom. No artifacts were found.

Feature 13 was a possible postmold in Slot Trench 23 (center of feature is S223.3 E210) and was probably related to Feature 12. It was about 20 cm in diameter, circular, with a rounded bottom, and 3 cm deep. The north half was excavated, and no artifacts were found.

Features 14 and 15 were possibly postmolds in Slot Trench 4 and were probably associated with Features 12 and 13. Features 14 and 15 had rounded bottoms and were identified at the base of the plowzone. Feature 14 was about 14 cm in diameter, circular, and only 5 cm deep. No artifacts were found. Feature 15 was about 19 cm in diameter, circular, and the entire feature fill was removed. The east half was excavated first. No artifacts were found.

Feature 16 was a fire-cracked rock hearth in Unit 24 of Block 4. It was oval shaped (center: S167.5 E192.0). It was identified at the base of Level 9 and extended to the base of Level 10. It was approximately 75 x 70 cm in diameter in Level 9 and 1.2 x 1 m in Level 10. Prehistoric artifacts included fire-cracked rock, charcoal, shell, and lithic debitage. No historic artifacts were found.

Feature 17 was an organic stain that may be from a storage pit. It was in Slot Trench 16 and Units 31-39 in Block 5. It was identified in the plowzone and the upper portion was truncated by plowing. The contents included fire-cracked rock, charcoal, shell, bone, lithic debitage and tools. The feature measured approximately 2.5 m x 1.75 m with a depth of 30 cm. The feature was first encountered in Slot Trench 16. Block 5 was excavated to expose this feature. Historic artifacts in Levels 1 and 2 of Feature 17 include ceramics, bottle glass, window glass, wire nails, and building material.

Feature 18 was a historic feature. It was the only historic feature uncovered at the site. The feature was rectangular, measuring about 1.32 m x 0.92 m and was oriented southwest-northeast. It was first identified in Level 1 and extended into Level 5. It appeared as a mottled charcoal-stained matrix intrusive into the B-horizon. Historic artifacts recovered included butchered animal bone, metal, window glass, bottle glass, buttons, egg shell, machine-cut nails, slate pencil fragments, a stoneware tobacco pipe fragment, a fork handle, and numerous refined earthenware sherds. Prehistoric items included lithic debitage and a chert biface.

During excavation, the size and shape of Feature 18 suggested that it may have been a privy or a trash-filled pit. The original function of this feature is unknown, but it was last used as a trash pit. Its shallow depth, square walls, and large size, suggest it was not a privy. It may have been a storage area under the dwelling or associated with an outbuilding, which was later used for trash disposal. The prehistoric lithic material probably represent bioturbation or simple mixture of material in the sediment that was deposited in the pit fill, or material deposited when the site was plowed.

Feature 19 was an organic stain in Block 2 (center: S209 E200.7). It was about 46 cm x 36 cm, oval shaped, and shallow. It was identified at the base of the plowzone and was largely removed by plowing. No cultural material was found; thus the age and cultural association of this feature are unknown.

Artifact Assemblages

Only limited artifact samples were recovered from this site (Tables 15.3-15.5). In particular, tool and core samples were very small, with only 33 pieces recovered from the three main block excavations.

Technology-Raw Material Use

Debitage samples show moderate frequencies of chert debitage in all samples. Higher frequencies for Block 2 (Table 15.6) are a manifestation of finescreening; this imposed high frequencies of small interior artifacts on that sample. Debitage from Blocks 3 and 4 (Tables 15.7, 15.8) are from 1/4-inch recovery, and exhibit higher frequencies of large and cortical debitage. Despite small samples, debitage from Block 4 includes significant proportions of cortical debitage. Fluctuations in cortical debitage occurrence is probably due to sampling error in a moderately bioturbated context. Of the three samples (Tables 15.9-15.11), Block 4 has the highest proportional occurrence of cores and blank-preforms, although none of the samples are large enough to accurately define assemblage characteristics with regard to manufacture versus maintenance reduction activities.

Chert is more common among tools/cores in Block 2 (75%) and Block 3 (57%) whereas chert is minor (33%) to quartzite in tools/cores from Block 4. The cherts appear dominated by regional chert, although one Scallorn point from Block 4 is made of a Novaculite-like material (Figure 15.6d), and a blank-preform and a biface fragment from the same block are made on local ferruginous sandstone (cf. quartzite); the other quartzite pieces are Ogallala. A single endscraper from level 3 of Block 2 is made of Edwards chert, and a chalcedony biface fragment was found in Block 3.

Table 15.3 ASSEMBLAGE COMPOSITION, DN79, BLOCK 2

LEVEL	DEB	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
1	77			2	79
2	72		2	1	75
3	55		1		56
4	45	1			46
5	37				37
6	20				20
7	14				14
8	21	1			22
9	12				12
10	10				10
11	10				10
12	7				7
13	4				4
TOTAL	384	2	3	3	392
PCT	97.96	0.51	0.77	0.77	

Table 15.4 ASSEMBLAGE COMPOSITION, DN79, BLOCK 3

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	N
1	61				1	62
2	215	1	1	5	1	223
3	104	2		1		107
4	45			2		47
TOTAL	425	3	1	8	2	439
PCT	96.81	0.68	0.23	1.82	0.46	

Table 15.5 ASSEMBLAGE COMPOSITION, DN79, BLOCK 4

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
1	52					52
2	28	1				29
3	93	1	1			95
4	78		1	1		80
5	49			1		50
6	45					45
7	47			1		48
8	43				1	44
9	45					45
10	48					48
11	31		1	1	1	34
12	33					33
13	23					23
TOTAL	615	2	3	4	2	626
PCT	98.24	0.32	0.48	0.64	0.32	

Table 15.6 DEBITAGE, DN79, BLOCK 2 (fine screen)

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
1	32	3	6	3	32	1			77	42.86	9.09	11.69
2	34	4	3	2	27	1		1	72	40.28	11.11	8.33
3	25	2	5	2	19		2		55	38.18	7.27	16.36
4	23	1	3	2	14	1	1		45	35.56	8.89	13.33
5	16	4	1	2	13		1		37	37.84	16.22	10.81
6	9		1	2	5	1	1	1	20	40.00	20.00	25.00
7	8			1	4		1		14	35.71	7.14	14.29
8	14		1		6				21	28.57	0.00	4.76
9	7		3	1	1				12	8.33	8.33	33.33
10	7				3				10	30.00	0.00	0.00
11	6		1	1	2				10	20.00	10.00	20.00
12	6			1					7	0.00	14.29	14.29
13	1				2		1		4	75.00	0.00	25.00

Table 15.7 DEBITAGE, DN79, BLOCK 3

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
1	29	11	4	3	8	1	4	1	61	22.95	26.23	19.67
2	89	36	17	33	33		4	3	215	18.60	33.49	26.51
3	26	18	11	27	14	4	2	2	104	21.15	49.04	40.38
4	12	5	5	9	11	1		2	45	31.11	37.78	35.56

Table 15.8 DEBITAGE, DN79, BLOCK 4

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
LEVEL									N	%	%	%
1	28	10	2	2	8	2			52	19.23	26.92	7.69
2	18	3	1	3	2		1		28	10.71	21.43	17.86
3	56	15	5	8	9				93	9.68	24.73	13.98
4	29	18	9	7	11	2		2	78	19.23	37.18	23.08
5	29	7	5	4	2	2			49	8.16	26.53	18.37
6	20	8	6	6	2	2		1	45	11.11	37.78	28.89
7	26	2	4	7	6		2		47	17.02	19.15	27.66
8	17	3	8	5	9		1		43	23.26	18.60	32.56
9	22	7	2	4	7	1	1	1	45	22.22	28.89	17.78
10	19	16	1	4	5	1	2		48	16.67	43.75	14.58
11	6	9	2	5	5	1	1	2	31	29.03	54.84	32.26
12	15	4	4	4	2	1	3		33	18.18	27.27	33.33
13	11	4	2	1	5				23	21.74	21.74	13.04

Typology

The small tool samples include a mixture of apparent Archaic and Late Prehistoric tools (Tables 15.9-15.11). Whereas arrowpoints predominate, dart points and Clearfork gouges are also present. These are probably the results of mixtures on the stable terrace surface, and/or scavenging. In Block 4, for example, a Clearfork gouge appears stratigraphically above the two arrowpoints in the block. Two gouges were recovered from Block 2, along with one side-notched dart point (Figure 15.6e). Arrowpoints include Scallorn (Figure 15.6d), serrated Scallorn and a Maud (Figure 15.6a). Blank preforms include those for arrowpoints (Figure 15.6b) and for dart points (Figure 15.6f).

Tools/cores from Block 5 include three dart point-size biface fragments (two Ogallala and one chert) an Ogallala blank-preform and a battered piece made on ferruginous sandstone. Overall, the tool assemblages from the site suggest a mixture of Archaic and Late Prehistoric materials. Except for the Clearfork gouge, the assemblage from Block 4 is suggestive of an early Late Prehistoric component; the radiocarbon ages support this conclusion. The small sample from Block 3 appears to be Late Prehistoric as well, perhaps later than that in Block 4. Recovery of "gunflints" and tubular bone beads (see below) suggested the presence of a Protohistoric occupation here. Unfortunately, we could not confirm this, and extensive finescreening failed to recover any trade beads. The material from Block 3 is suggestive of an Archaic occupation, with only one arrowpoint, and a dartpoint, two gouges, a burin made on a dart point and a discoidal core.

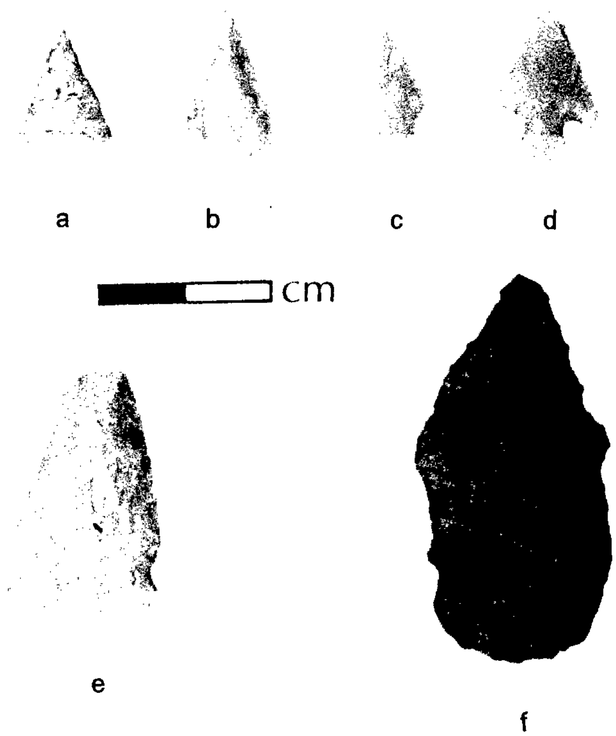


Figure 15.6 Projectile points from 41DN79.
Provenience (block/level): a- 2/2; b- surface; c- 3/1; d- 4/11; e,f - 3/2.

Table 15.9 ARTIFACT TYPOLOGY, DN79, BLOCK 2

TYPE	LEVEL 1	2	3	4	5	6	7	8
Maud		1/-						
Washita?	-/1							
Indet. arrow	1/-							
Atyp. endscraper		1/-	1/-					
Unilat ret		1/-						
Blank-pre								-/1
Biface frag.				1/-				

-/- CHERT/QUARTZITE

Table 15.10 ARTIFACT TYPOLOGY, DN79, BLOCK 3

TYPE	LEVEL 1	2	3	4
Scallorn, serr.	1/-			
Side-notch dart		1/-		
Clearfork gouge		-/1	-/1	
Burin on biface		1/-		
Unilat ret		1/2		1/-
Battered piece				1
Blank-pre		1/-		
Biface frag.				
CORES				
Mult. plat. flake		1/-	1/-	
Discoidal flk			-/1	

-/- CHERT/QUARTZITE

Table 15.11 ARTIFACT TYPOLOGY, DN79, BLOCK

TYPE	LEVEL 2	3	4	5	6	7	8	9	10	11
Scallorn										1/-
Indet. arrow							-/1			
Unilat. Ret.			1/1	1/-						
Dist-lat ret.										1/-
Clearfork Gouge						-/1				
Mult. Plat. core	-/1									
Bipolar core on flk		-/1								
Blank-pre			-/1							
Biface frag.		-/1								-/1

-/- chert/quartzite

ZOOARCHAEOLOGY

A total of 709 identified elements out of approximately 3,000 fragments were recorded from nine prehistoric features (Table 15.12). Therefore, the faunal assemblage was analyzed as discrete depositions in these features. Feature 18 was considered primarily historic in context and will not be dealt with here (see Lebo in prep). Most of these features were small pits or possible postmolds with less than 25 identified faunal remains, and some of them had historic materials mixed in the upper levels; for example, Feature 8 contained remains of domestic pig along with deer and indeterminate large mammal, and Feature 18 had historic artifacts mixed with prehistoric lithics down to level 10.

Table 15.13 provides listings of the identified vertebrates documented for the features. From these lists, it is apparent that turtle, rodent, rabbit, and the odd deer bone repeatedly occur in these features. Only Features 1 and 2 have medium-size mammals and birds and show exploitation of other habitats such as aquatic and riparian. These two features have been interpreted as middens located in natural gullies and together are responsible for 70% of the bone from current excavations at this site.

Table 15.12 Summary of Faunal Remains, 41DN79

Block/Prov.	Total	Identified	Burned
1*	53	5 (10%)	13 (25%)
2 (Fea. 18)	684	181 (26%)	62 (9%)
3 (Fea. 1)	2,073	533 (26%)	121 (6%)
4 (Fea. 2)	273	110 (40%)	76 (28%)
4 (Fea. 6)	109	19 (17%)	50 (46%)
4 (Fea. 16)	2	2	0
5 (Fea. 17)	110	4 (4%)	21 (19%)
BHT 1 (Fea. 10)	148	26 (18%)	77 (52%)
SLT 10 (Fea. 8)	46	8 (17%)	13 (28%)
SLT 23 (Fea. 11)	53	6 (11%)	11 (21%)
SLT 23 (Fea. 12)	1	1	0
Other	55	17 (31%)	2 (4%)

*Block 1 was excavated in 1982 (Yates 1985)

In Feature 1, rodent remains predominate, an unusual situation for most prehistoric middens in the project area in which butchered deer elements usually predominate. In this case, fewer than 30 elements (5%) of mammals larger than a jackrabbit were recognized out of 1,540 fragments. Fine screening the matrix resulted in 82% of these fragments. Only two turtle shell fragments and two rabbit elements were identified from the burned bone samples. Twelve individual pocket gophers and eight voles were estimated among the seven rodent taxa.

Feature 2 yielded not quite one-eighth the amount of bone as was recovered from Feature 1. Nevertheless, it contained remains of the only medium-size mammals found in the prehistoric features: opossum, beaver, raccoon, and skunk. And like Feature 1, larger mammals are not well represented, but dissimilarly, rodent taxa are not abundant in kind or individuals. Among the identified fraction, 22 of the elements were burned; these include turtle, beaver, rodent, and raccoon. The burned rodent element is a metapodial from a large rodent the size of a gopher or cotton rat.

Three prehistoric features were found in Block 4, the only area of the site with unmixed context. Unfortunately, faunal materials from this block were sparse. The bones from Feature 10 are interesting because of the high frequency of burning; 65% of the identified elements show effects of fire. Nearly all of the turtle shell was calcined, either as a result of cooking the turtle in shell or from use of the shell as a vessel. Fish and deer bone were also burned.

Table 15.13 FAUNAL REMAINS FROM FEATURES 41DN79

Feature 1 (Filled gully in southern area of site, Block 3)

Taxon	NISP	MNI*
Indeterminate Fish	1	-
Toad/Frog	7	-
Toad sp.	1	1
Box Turtle	2	1
Red-eared Turtle	2	1
Indeterminate Turtle	31 (2 B)	-
Non-poisonous Snake	29	-
Poisonous Snake	8	-
cf. W. Ribbon Snake	1	1
Indeterminate Snake	17	-
Wild Turkey	1	1
Sparrow sp.	1	1
Cottontail	30 (2 B)	3
Black-tailed Jack Rabbit	3	1
Swamp/Jack Rabbit	1	-
Ground Squirrel	4	1
Pocket Gopher	169	12
Pocket Mouse	10	2
Deer Mouse	3	1
Grasshopper Mouse	1	1
Cottonrat	13	3
Vole	75	8
Indeterminate Rodent	79	-
Deer	9	1
Deer/Pronghorn	6	-
Indeterminate Mammal, small	14	-
Indeterminate Mammal, medium	1	-
Indeterminate Mammal, large	14	-
Unidentified fragments	1,540 (117 B)	

Feature 2 (midden, Block 4, lv. 1-12)

Taxon	NISP	MNI
Gar sp.	2	1
Bullfrog	1	1
Musk/Mud Turtle	2 (1 B)	1
Box Turtle	17	1
Indeterminate Turtle	63 (14 B)	-
Non-poisonous Snake	1	-
Opossum	1	1
Cottontail	1	1
Beaver	1 (B)	1
Vole	1	1
Indeterminate Rodent	1 (B)	-
Raccoon	3 (2 B)	1
Striped Skunk	1	1
Deer	3 (1 B)	1
Pronghorn	1	1

Table 15.13, cont.

Deer/Pronghorn	5 (1 B)	-
Indeterminate Mammal, large	5 (1 B)	
Unidentified fragments	163 (54 B)	

Feature 6 (rock hearth, Block 4, lv. 3-8)

Taxon	NISP	MNI
Box Turtle	2	1
Indeterminate Turtle	9 (4 B)	1
Non-poisonous Snake	1	-
Squirrel	1	1
Pocket Gopher	1	1
Indeterminate Rodent	4	-
Indeterminate Mammal, small	1	-
Unidentified fragments	90 (46 B)	

Feature 8 (organic stain, storage pit?, SLT 10, lv. 1)

Taxon	NISP	MNI
Domestic or Feral Pig	1	1
Deer	2	1
Indeterminate Mammal, large	5	-
Unidentified fragments	38 (13 B)	

Feature 10 (midden, BHT 1, lv. 1-4)

Taxon	NISP	MNI
Indeterminate Fish	2 (B)	-
Catfish	1	1
Bass/Sunfish	1	1
Musk/Mud Turtle	1 (B)	1
Box Turtle	2 (1 B)	1
Indeterminate Turtle	11 (B)	-
Cottontail	1 (B)	1
Pocket Gopher	4	1
Deer	2 (1B)	1
Indeterminate Mammal, large	1	-
Unidentified fragments	122 (60 B)	

Feature 11 (hearth/rodent den?, SLT 23, lv. 1)

Taxon	NISP	MNI
Indeterminate Turtle	2 (1 B)	-
Cottontail	1	1
Pocket Gopher	1	1
Pocket Mouse	1	1
Deer/Pronghorn	1	-
Unidentified fragments	47 (10 B)	

Table 15.13, cont.

Feature 12 (postmold?, SLT 23, lv. unknown)

Taxon	NISP	MNI
Pocket Gopher	1	1
Unidentified fragments	0	

Feature 16 (rock hearth, Block 4, lv. 9-10)

Taxon	NISP	MNI
Snapping Turtle	1	1
Indeterminate Rodent	1	-
Unidentified fragments	0	

Feature 17 (organic stain/storage pit?, Block 5, lv. 1-2)

Taxon	NISP	MNI
Pocket Gopher	1	1
Indeterminate Rodent	1	-
Deer	2	1
Unidentified fragments	110 (21 B)	

Feature 18 (Historic filled pit, Block 2, lv. 1-5)

Taxon	NISP	MNI
Indeterminate Fish	4	-
Catfish	1	1
Bass/Sunfish	2	1
Toad	1	1
Indeterminate Turtle	1	-
Rat Snake	1	1
Non-poisonous Snake	1	-
Indeterminate Snake	1	-
Duck sp.	1	1
Wild Turkey	14	1
Red-tailed Hawk	1	1
Domestic Chicken	5	2
Meadowlark	1	1
Woodpecker sp.	1	1
Cardinal	1	1
Indeterminate Bird, small	7	-
Indeterminate Bird, medium	12	-
Indeterminate Bird, large	4	-
Cottontail	5	1
Fox Squirrel	10	2
Pocket Gopher	1	1
Pocket Mouse	1	1
Deer Mouse	2	1
Harvest Mouse	1	1
Woodrat	6	2
Cottonrat	1	1

Table 15.13, cont.

Vole	1	1
Indeterminate Rodent	7	-
Raccoon	3	1
Domestic Pig	9	1
Deer	6	1
Domestic Cattle	1	1
Cow/Bison/Elk	1	-
Horse	1	1
Indeterminate Mammal, small	8	-
Indeterminate Mammal, medium	4	-
Indeterminate Mammal, large	30	-
Unidentified fragments	503 (62 B)	

Non-Feature Units

Taxon	NISP	MNI	Prov.
Indeterminate Turtle	1	-	SLT 23
Box Turtle	1	1	SLT 10
Deer	3	1	SLTs 4,6,8
Deer/Pronghorn	3	-	SLTs 2,8
Cow/Bison/Elk	1	-	BHT 2
Sheep/Goat	5	-	BHT 8
Indeterminate Mammal, medium	1	-	BHT 2
Indeterminate Mammal, large	2	-	SLT 8

Key to abbreviations:
NISP = number of identified specimens
MNI = minimum number of individuals
BHT = backhoe trench
SLT = slot trench
B = burned (included in totals)
Prov. = provenience

Eighteen bones from this site are modified, all but one of which were found in Feature 18; the exception is a deer metapodial with a skinning cut mark from Backhoe Trench 8. From Feature 18, eight butcher-marked bones are pig or large mammal elements with saw cuts, and most clearly are associated with the historic component. Butchering marks are apparent on pig, cattle, squirrel, and raccoon bones. Three turkey radii have been modified into long, tubular beads similar to what are known in Plains archaeology as "hair pipes"; these are more akin to the prehistoric variety than to the commercially made trade items. Ewers (1957:75) comments that before the familiar hair-pipe breastplates of the Plains Indians, ear pendants were one of the earliest decorative forms among American Indians. Usually found as one or two beads associated with the skull in prehistoric burials, they may also represent hair ornaments, hence the name. According to Ewers (ibid), the earliest recorded use of hair-pipe ear ornaments in the Plains was among the Osage in 1806; use was defined among the Caddoan, Wichita, and Pawnee prior to 1850. Any of these three groups are possible occupants of this site during the late nineteenth century, when Native Americans were resetted throughout North Texas and Oklahoma.

Faunal Summary

Prehistoric and historic materials are deeply mixed over much of this large site, and consequently the faunal remains from those associations are indistinguishable. Domestic animal bones occur in the same contexts as wild game reamins and prehistoric artifacts. Although research has demonstrated that wild game comprised a minor, but important, role in the subsistence of historic settlement period occupations (Yates 1992), the proportions of wild game to domesticates in this assemblage does not fit the pattern of a nineteenth-century Euro-American farmstead in northcentral Texas. Lebo (in prep) has postulated that parts of this site may be associated with a historic Native American occupation.

Historic artifacts were found in the upper levels of Features 1, 2, and 8 and much deeper in Feature 18. Domesticates were identified in Features 8 and 18. Of these, only the faunal remains in Feature 2 have attributes (viz., high frequency of burned elements, breakage patterns, faunal composition) more in keeping with prehistoric middens.

Feature 6 (a rock hearth) and Feature 10 (a storage pit) are the best candidates for discrete prehistoric features at 41DN79. Feature 6 had less than 100 bone fragments, with rodents and reptiles as identified fauna. Feature 10 had a slightly larger collection, but with a more complete faunal assemblage, many burned elements, and some large mammalian remains.

SUMMARY

The Vaughantown Site has a complex, yet poorly preserved archaeological record that was formed from the Archaic through the Historic periods. Intensive disturbance from repeated occupations, erosion, bioturbation and plowing were documented. Earlier claims for architecture at the site could not be substantiated, despite intensive exploration for architectural features. The only part of the site where prehistoric occupation materials are in relatively good context in the area of Block 4, where colluvium has protected artifacts and features in older colluvium. The occupation materials there is dated to the earlier part of the Late Prehistoric period, with evidence of hunting, artifact manufacture and hearth use. Other parts of the site yielded a mixture of Archaic, Late Prehistoric and Historic age materials in shallow, disturbed contexts in or just below the plow zone.

The large, basin shaped geologic feature in the central part of the site should be compared to "Wylie Focus Pits" (Stevenson, 1958; Lynott, 1979; McGregor and Bruseth, 1987). In geologic terms, these features should be compared to "pimple mounds" (cf., "mima mounds"), in that: a) they are widespread features, b) they occur in diverse geologic-geomorphic settings, c) they have ambiguous origins. The feature at 41DN79 (and the smaller feature at 41DN81) meet many of the criteria for "Wylie Pits", having sub-circular plans, very irregular bases and no clear cultural stratification or feature associations. At 41DN79 the feature appears to pre-date most of the archaeology at the site, but this is not certain. Without conclusive evidence, we are reluctant to attribute the feature to human activity. At the same time, one would have to allude to either a karstic or biogenic origin for these. Because of the sandy-gravelly texture of the sediments, we do not see a case for a pedogenic origin, similar to that of gilgai features.

CHAPTER 16
THE SIMPSON SITE (41DN81)

INTRODUCTION

Site 41DN81 is located on the same Pleistocene terrace along the Elm Fork of the Trinity River as are 41DN79, 41DN80, and 41DN82 (Figure 16.1). The site has both prehistoric and historic components. The prehistoric component occurs in two sections separated by a barbed-wire fence and a dirt road. The historic component is north of the road. Both site areas were in cultivation when site 41DN81 was recorded. The cultural remains are shallowly buried within the plowzone, and the site measures approximately 50 m east-west and 40 m north-south.

Previous Investigations

The site was recorded by ECI in 1980. A diffuse surface scatter of fire-cracked rock, lithic debris, historic ceramics, glass, and metal was observed. A small surface sample was collected. Initial testing included ten auger test holes and four 1x1m test pits. Following this work, 25 shovel test pits were excavated in two areas of the site. Ten were placed in the northern section. While a cultural deposit was identified, no subsurface artifacts were recovered. Fifteen shovel test pits were dug in the southern section. A single bottle glass fragment

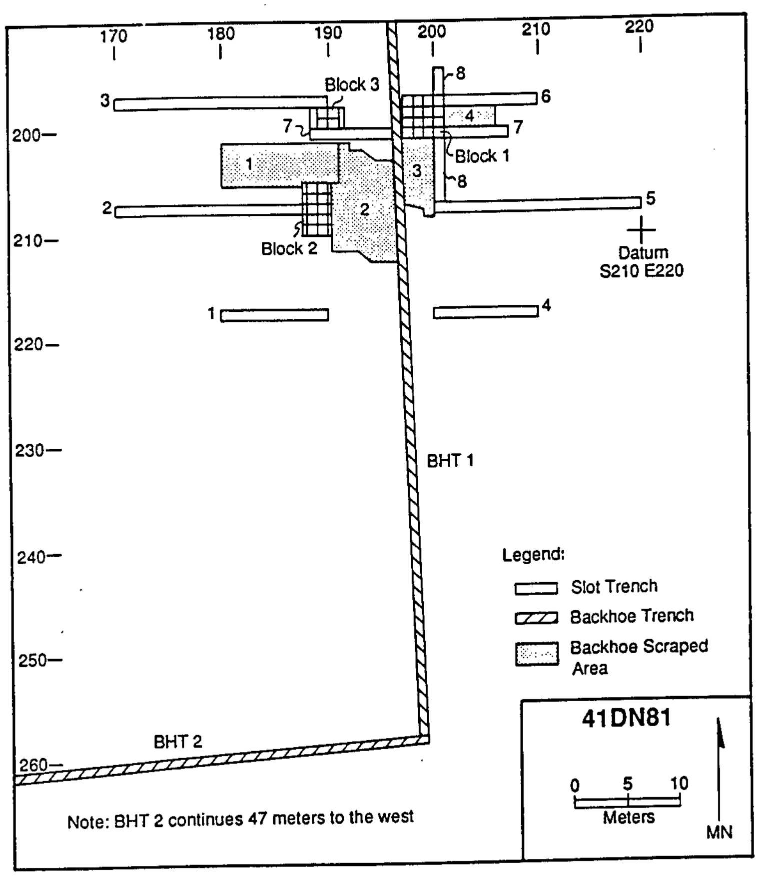


Figure 16.1 Map of excavations at 41DN81.

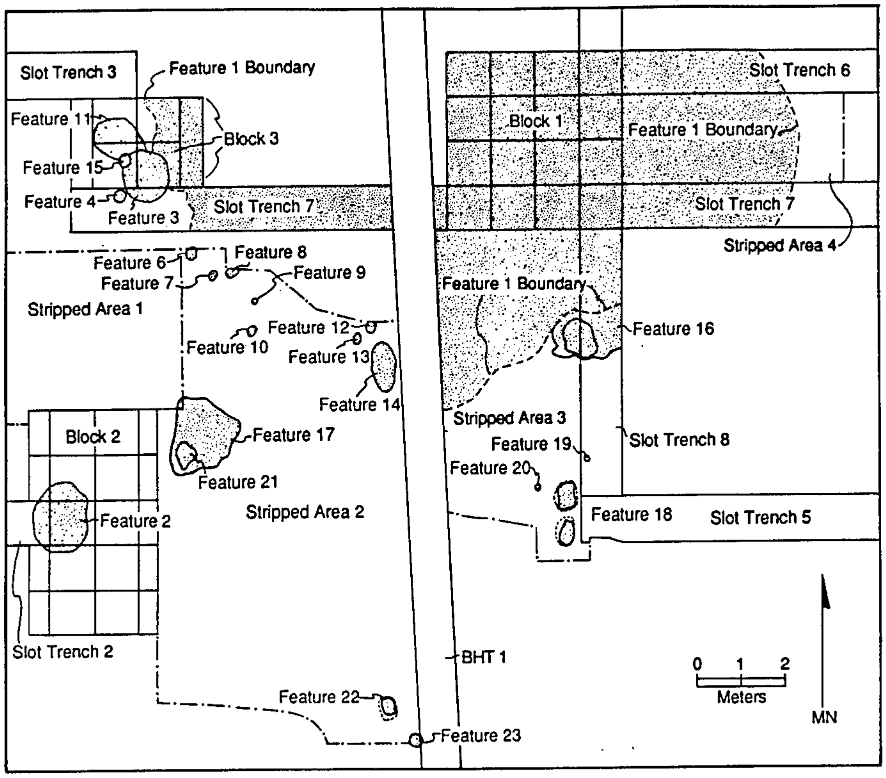


Figure 16.2 Location of features at 41DN81.

was found in one unit. Five additional test units were dug. Units 5 and 9 were 2x2 m units, while Units 6-8 were 1x1 m units. Historic material was found in each of these units (see Appendix J). A historic privy pit feature was identified in Unit 6, and a fire-cracked rock hearth was uncovered in Unit 5. Unit 9 revealed a circular pit measuring 110 cm in diameter and extending to 45 cm below the surface.

Based on these test excavations, the prehistoric component was assigned to the Neo-American period (Late Prehistoric), and further excavation of the prehistoric component was recommended (Skinner and Baird 1985). The historic material was assigned a late nineteenth-century date, and no further investigation of this component was recommended.

SITE SETTING AND GEOLOGY

Site 41DN81 is situated in the same geomorphic setting as Site 41DN79, on a Denton Creek Terrace, about 6 m above the Elm Fork Trinity River floodplain (Figure 15.1). The site area is virtually level, and has been plowed for many decades. The slough on the adjacent floodplain may have been an active channel during some of the prehistoric occupations, yet no data are available to determine that the slough is in fact a paleochannel.

Stratigraphy-Soils

No geologic investigations were undertaken at this site. With the exception of intrusive features, the sediments and soil at this site are very similar to that of Site 41DN79. The surface soil of the terrace in the site area is an Alfisol, with a thin plowzone (Ap horizon) above a thick, red B horizon. This soil formed in sandy to loamy Pleistocene alluvium. The terrace surface has probably been quasi-stable for ca. 20,000 years, and there is no evidence of any kind of sedimentation subsequent to abandonment of this surface in the late Pleistocene. With the possible exception of Feature 1, discussed below, all deeper features at the site are intrusive constructions such as firepits, storage pits or historic features including a privy pit. Good bone and shell preservation in the area of Feature 1 (Figure 16.3) here is inconsistent with the geology of the sandy, acidic terrace sediments, as discussed later.

Geochronology

Two radiocarbon ages have been obtained from the site. A radiocarbon age of 938 +/- 100 BP (Beta-5677) was obtained by ECI on charcoal recovered from the feature in their test unit 9 (Skinner and Baird 1985:4-22). UNT dated charcoal from a hearth feature in Block 2; the age of 693 +/- 80 BP (Beta-32526) possibly pertains to a Late Prehistoric component at the site, yet the association is very weak, since no diagnostic artifacts were recovered from the Block 2 excavations. Overall, therefore, the lithic artifacts from the site provide the best available insight into periods of occupation.

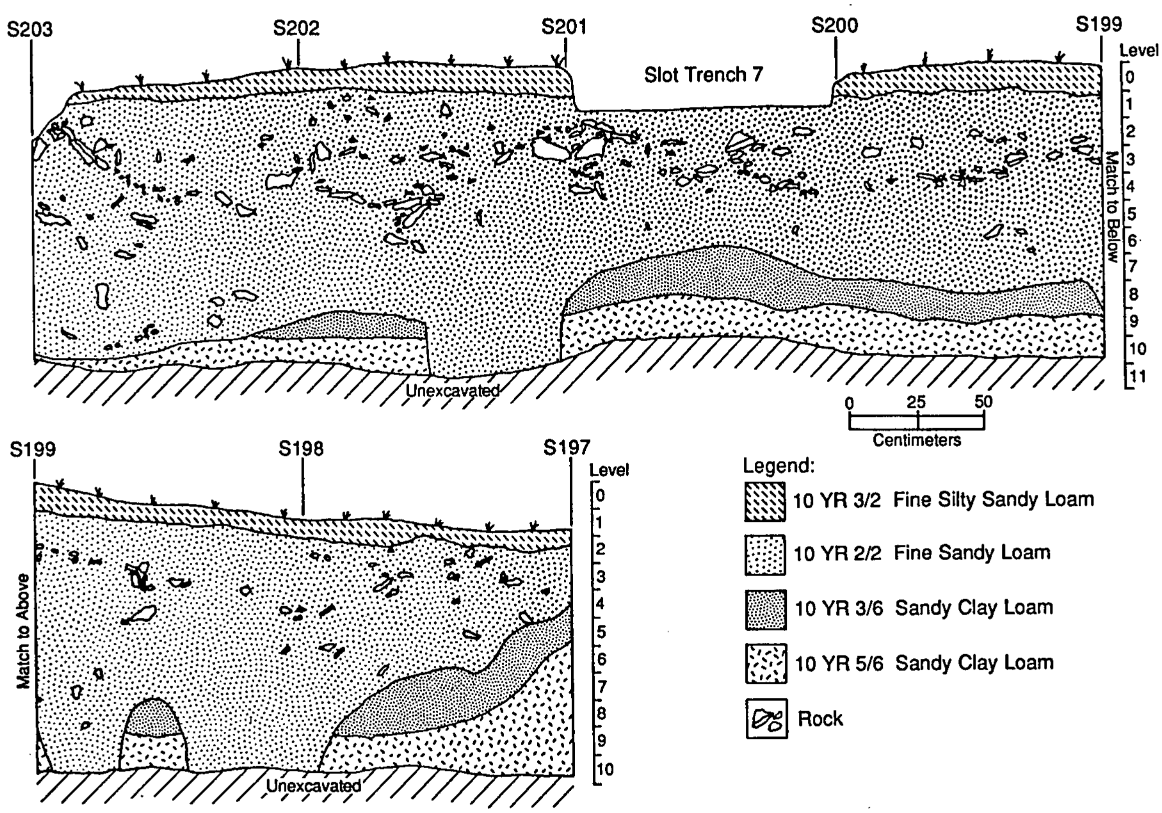


Figure 16.3 Cross-section of Backhoe Trench 1, 41DN81.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Methods

Figure 16.1 illustrates the excavations conducted in 1987 to examine the prehistoric component at 41DN81. This effort included excavation of two backhoe trenches, hand-excavating eight slot trenches, stripping the plowzone in four areas, and excavation of three blocks. Backhoe Trench 1, over 100 m long, was oriented north-south through the center of the site, and was excavated to examine subsurface archaeological features, geological strata and depositional contexts (Figures 16.2, 16.3). Backhoe Trench 2 was placed perpendicular to Trench 1 at the south end of the site. It was ca. 50m long, and was dug to obtain similar data. Slot trenches were approximately 1m wide and were sufficiently deep to remove the plowzone and expose underlying deposits, usually the soil B-horizon. The stripped areas were excavated to expose large areas for locating shallowly buried, undisturbed cultural deposits and features. The distribution of features uncovered during excavations at 41DN81 is shown in Figure 16.2.

Backhoe Trench 1 revealed a midden deposit containing large quantities of fire-cracked rock (FCR) and lithic debris. Stripped Area 1 was between Blocks 2 and 3, adjacent to the west edge of Stripped Area 2. Stripped Areas 2 and 3 provide coverage of the west and east site areas adjacent to BHT 1 at the north end of the site (Figure 16.1, 16.2). Stripped Area 2 was placed to obtain additional information on the FCR concentration and cultural debris exposed in BHT 1. The slot trenches were dug to provide additional coverage between the stripped areas for identifying subsurface features, as well as coverage near the site limits.

Only three small blocks were excavated at 41DN81. Block 1, a 4x4 m area, is north of Stripped Area 3 and west of Stripped Area 4. The west edge of Block 1 extends into the east profile of Backhoe Trench 1 at the north end of the site. Block 2, a 2.5x5 m area is on the west side of Stripped Area 2, and Block 3 is north side of Stripped Area 1. Block 3, a 2x2 m area, was placed to excavate several shallow features uncovered in slot Trenches 3 and 7. Level 1 in Blocks 2 and 3 was removed by scraping in Stripped Areas 1 and 2.

Cultural Stratigraphy

Features

The site contained shallowly buried prehistoric and historic remains and features. The upper portions of many features were truncated by plowing and/or erosion. The prehistoric component was disturbed by the historic occupation and recent cultivation. However, in the vicinity of Block 1 is a prehistoric midden containing a dense concentration of rock-lined hearths, used repeatedly over a long period, and lithic and faunal debris. The historic component is a domestic farmstead dating to the late nineteenth and early twentieth century.

Twenty-three features were identified at 41DN81 during the 1987 excavations. Most of the features were associated with post-settlement occupation of this site; these included a cellar (Feature 16), and several postmolds and piers related to historic structures (Features 4,6,7,10,13,15,18,19,21,22,23). Features 8,9 12, and 20 were given feature numbers in the field, but were non-cultural stains or disturbances. Even in the "prehistoric" features, such as Features 1,2 and 11, historic artifacts were found throughout the fill. The historic features are described in Lebo (1992), and are not considered further here. The intensive use of the central site area during the historic period complicates interpretation of all the features here. Historic features are shown in black in Figure 16.2.

Feature 1 was first identified in Backhoe Trench 1 where it extended from the interface between the plowzone and the underlying matrix to a depth of 80 cm below surface (Figures 16.2, 16.3). It extended for a distance of approximately 10 m along Backhoe Trench 1. The feature fill contained FCR, bone, shell, charcoal, debitage, and stone tools.

Block 1 was excavated east of Backhoe Trench 1 to obtain content and spatial data on Feature 1. Block 1 is located entirely in Feature 1. Additional units where Feature 1 is mapped are Slot Trenches 6, 7, and 8, and Stripped Areas 2, 3, and 4, and Block 3. This feature was only partially excavated (see Figure 16.2).

Feature 1 was excavated in 10-cm levels to the base of Level 12 in Units 13, and 14; Level 11 in Unit 7; and the base of Level 10 in the rest of Block 1. The bottom of the feature was irregular. The rocks found in Levels 11 and 12 were unburned, and no charcoal, ash, or burned matrix occurred. FCR decreased in frequency by Level 9, and in Level 10, they occurred predominately in rodent-disturbed areas. Rodent burrows are evident throughout the feature and still occur in Level 12.
Historic artifacts also occurred in Feature 1 and extended from Level 1 to Level 10. These artifacts indicate the extent of historic intrusion, the downward vertical movement of material in Feature 1, and along with the bioturbation data, indicate the impact of post-depositional activities on Feature 1. The historic artifacts in Feature 1 are summarized in Lebo (1992).

Feature 2 was first identified in Slot Trench 2. In profile, the feature is V-shaped. Feature 2 was exposed below the plowzone and was approximately 1.66 m x 1.67 m with a depth of 32 cm. The bottom diameter was 50 cm. The feature contained FCR, burned bone, burned clay, and charcoal. The entire feature was removed for finescreening. Two charcoal samples were collected for radiocarbon dating. Charcoal from the fill yielded a radiocarbon date of 693 +/- 80 BP (Beta-32526).

Feature 3 was identified as a possible storage pit, last used for refuse disposal. It measured approximately 1.15 m x 1.36 m when exposed below the plowzone. The upper portion was removed and the base was 35 cm below the plowzone. The feature appeared as an organic-stained area with sloping walls, a basin-shaped bottom, and contained a diffuse scatter of FCR, shell, bone, and lithics. Level 2 in the northeast half was removed as part of Unit 18 to find the limits of the feature. The remainder of Feature 3 in Unit 18 was removed as part of Feature 11, a second possible storage pit used for refuse. It was not determined which feature was intrusive.

Feature 5 was a postmold identified below the plowzone in Block 2. It was 22 cm x 14 cm in diameter and 10 cm in depth. It is elliptical with a rounded bottom and contained unburned bone and lithics. The north half was removed for flotation. No historic artifacts were found in this feature.

Feature 11 (see Feature 3) was a possible storage pit last used for refuse disposal. Features 11 and 3 overlap, and the northeast half of Feature 3 was removed as part of Feature 11. Both features were exposed below the plowzone. Feature 11 measured approximately 95 cm x 115 cm with a depth of 92 cm below the plowzone. It was an organic-stained area with steep sides and a flat bottom, which contained a diffuse scatter of FCR, shell, bone, and lithics.

Feature 14 was identified as a possible hearth later used for refuse disposal. It was exposed at the base of the plowzone in Stripped Area 2 and contained bone, lithics, shell, and FCR. It measured about 2.04 m x 1.96 m in diameter with a depth of 25 cm below the plowzone. The feature had steep-sloping sides and a slightly concave bottom. The upper portion of Feature 14 was truncated by plowing.

Feature 16 was located in Stripped Area 3. It was exposed in Level 1 and extended into Level 9. It measured 1.10 m x 1.60 m in diameter, was oval shaped, and contained both prehistoric and historic artifacts. This feature was identified as a possible collapsed cellar filled with historic trash. The north half was finescreened, and flotation samples were collected from each level in the south half. The fill contained charcoal, ash, few lithics, bone, and shell, and quantities of historic domestic trash. A total of 2,898 historic artifacts were collected from Feature 16.

Feature 17 was a hearth or fire-related deposit. It was exposed below the plowzone in Stripped Area 2. It measured approximately 1.7 m x 1.6 m in diameter with a maximum depth of 26 cm below the plowzone. It was a circular pit with irregular walls and contained debitage, a few tools, shell, charcoal, sparse FCR, bone, and burned clay.

Artifact Assemblages

A sample of over 3,700 artifacts was recovered from Block 1 (Table 16.1). This included approximately 3.5% tools and cores. No ceramics were found.

Technology-Raw Material Use

Debitage samples show changes in the frequency of cortical pieces (Table 16.2). The deeper levels (12-9) have about 50% cortical flakes, while the upper levels have between ca. 28-44% cortical pieces. Chert debitage has higher frequencies below level 6 (ca. 30-38%) with frequencies of ca. 21-25%) in the higher levels (2-6). Tool and core samples are small, but do provide evidence of different raw material use (Tables 16.3, 16.4). Distinct raw material differences separate the arrowpoints and dart points. Of the eight arrowpoints, seven are made of chert. Of the 26 dart points, only 14 are made of chert, and 9 of the chert forms are untyped (mostly fragments). Only 5 of the 30 blank-preforms are made of chert, but 11 of the 17 cores are made of chert. Novaculite was noted as the raw material for and end scraper (level 8), a retouched piece (level 7) and 3 biface fragments (level 3). Single biface fragments from levels 8 and 11 were on Edwards chert; the remainder are regional cherts.

Table 16.1 ASSEMBLAGE COMPOSITION, DN81, BLOCK 1

LEVEL	DEB	CORES	BLANK-PRE	UNIFACES	PROJ PTS	TOTAL
2	238	4	8	3	7	260
3	707	3	10	7	3	730
4	638	1	10	6	3	658
5	596	1	6	5	4	612
6	485	1	4	3	5	498
7	556	3	5	8		572
8	374	1	7	5	3	390
9	342	1	2	5		350
10	293		2	4		299
11	135		1	1	1	138
12	50		1	1		52
TOTAL	3594	14	50	37	25	3720
%	96.61	0.38	1.34	0.99	0.67	

Table 16.2 DEBITAGE, DN81, BLOCK 1

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
LEVEL	INT	CTX	INT	CTX	INT	CTX	INT	CTX	N	Chert %	Cortex %	Large %
2	105	49	15	18	38	7	3	3	238	21.43	32.35	16.39
3	326	103	65	65	103	23	13	9	707	20.93	28.29	21.50
4	220	158	42	78	104	16	15	5	638	21.94	40.28	21.94
5	188	148	24	84	108	25	9	10	596	25.50	44.80	21.31
6	188	100	36	52	64	17	17	11	485	22.47	37.11	23.92
7	206	98	40	45	111	24	16	16	556	30.04	32.91	21.04
8	138	62	19	41	72	15	15	12	374	30.48	34.76	23.26
9	86	83	17	55	51	31	6	13	342	29.53	53.22	26.61
10	68	61	8	53	49	38	8	8	293	35.15	54.61	26.28
11	42	28	6	7	28	12	6	6	135	38.52	39.26	18.52
12	12	16	2	4	9	4	2	1	50	32.00	50.00	18.00

Typology

The unifacial tools are dominated by retouched pieces, many of which are in the shallower levels and may relate to disturbance such as trampling in the rocky sediments. A fair number of endscrapers and sidescrapers is present however, as well as three Clearfork gouges (Table 16.3). Identifiable cores are all single or multiple platform flake types.

Eight of the projectile points are arrowpoints (Table 16.4) These include a broken Scallorn (Figure 16.4c), a Perdiz, a Fresno and several untyped forms (eg., Figure 16.4 b,i). Many of the dartpoints are untyped, perhaps indicating considerable re-use and sharpening (eg., Figure 16.4 h,i). Typed specimens include Elam (Figure 16.4g), Ellis, Yarborough (Figure 16.4f), Carrollton (Figure 16.4m,n) and Trinity (Figure 16.4k,l). Interestingly, no Gary or Godley forms were recovered, yet Middle Archaic forms such as Wells and a Calf Creek Tang were found. These, and the Clearfork gouges, suggest a Middle Archaic occupation, albeit with some possible scavenging by later Archaic peoples. The higher proportion of cortical pieces and especially the high number of blank-preforms and cores suggest a modest amount of lithic manufacture took place.

Very small tool samples were recovered from the other blocks. From Block 2, three modified pieces from level 1 were found: an indeterminate chert arrowpoint, a retouched chert flake and an Ogallala blank-preform. From Block 3 the following were recovered: an indeterminate Ogallala arrowpoint (level 3), an Ogallala double side \scraper (level 2), 2 blank-preforms (levels 3,4), 2 biface fragments (levels 2,4) and an Ogallala core fragment (level 4).

Table 16.3 ARTIFACT TYPOLOGY, DN81, BLOCK 1

TYPE	LEVEL 2	3	4	5	6	7	8	9	10	11	12
Endscr on bif							1/-				
Atyp. endscraper			1/1	1/-		1/-			1/-		
Side scraper								-/1			
Endscr+ graver		-/1									
Double sidescr							1/-	1/-			
Clearfork gouge		-/1				-/1	-/1				
Unilat ret	1/1	3/-	1/-	1/-	2/-	-/2			2/-	1/-	1/-
Dist-lat ret.	1/-	-/1	-/1	1/1	1/-	1/-	2/-		1/-		
Bilat ret			1/-	1/-		1/2					
Varia		-/1	1/-					3/-			
Biface frag	1/2	3/1	2/3	2/2		1/1	3/-	1/-	1/1	1/-	-/1
Blank-preform	1/4	-/6	1/4	1/1	-/4	1/2	1/3	-/1			
CORES											
Single plat flake		1/-					-/1				1/-
Mult plat flake	-/1		1/-								
Core frag	1/2	1/1		1/-	1/-	2/1	1/-	1/-			
Total	15	20	17	12	8	16	14	8	6	2	3
Pct Chert	33	40	47	67	50	44	64	75	83	100	67

Table 16.4 PROJECTILE POINT TYPOLOGY, DN81, BLOCK 1

TYPE	LEVEL 2	3	4	5	6	7	8	9	10	11	12
ARROW POINTS											
Fresno		1/-									
Perdiz	1/-										
Scallorn							1/-				
Untyped	1/-		3/1								
DART POINTS											
Elam	-/1				-/1						
Ellis			1/-								
Yarborough				-/1			1/1				
Carrollton	-/1	-/1								1/-	
Trinity		-/1					1/-				
Wells				-/1							
Palmillas			-/1								
Calf Creek tang				1/-							
Untyped	3/2	1/-	1/-	1/-	3/1						
Total	7	3	3	4	5		3			1	
Pct Chert	43	33	67	50	60		67			100	

Table 16.5 ARTIFACT DENSITIES, DN81, BLOCK 1

level	% burned	debden (n/m3)	artden (n/m3)	boneden (n/m3)	mussden (gm/m3)	rockden (gm/m3)
2	71.43	148.75	162.50	111.88	516.88	7198.10
3	26.84	441.88	456.25	225.00	4086.88	63195.60
4	31.74	398.75	411.25	276.25	6873.13	88913.80
5	33.23	372.50	382.50	262.50	8575.00	55133.10
6	33.67	303.12	311.25	241.88	7815.63	22840.00
7	40.19	347.50	357.50	207.50	7041.88	409733.10
8	47.66	233.75	243.75	146.25	3446.25	86366.30
9	46.34	213.75	218.75	165.00	5516.25	50774.40
10	51.22	183.13	186.88	151.25	1822.50	31013.80
Mean	42.48	293.68	303.40	198.61	5077.16	90574.24
Std Dev	12.84	97.42	99.10	54.15	2625.56	115738.92

Artifact densities in Block 1 are remarkably high (Table 16.5). Especially high densities of burned rock and mussel shell, as well as high frequencies of burned bone suggest that this portion of the site is essentially a burned rock midden. These densities are the highest of any encountered in the mitigation excavations at Ray Roberts, and are only approached by some of the levels at 41CO141.

Almost all the lithic tools have calcium carbonate coatings. Because the terrace sediments are non-calcareous, the source for this dissolved and re-precipitated carbonate must have been the shell and bone that was introduced culturally. Sufficient introduced carbonate probably buffered the sediments, promoting preservation of the larger shell and bone fragments, but dissolution of the smaller fragments.

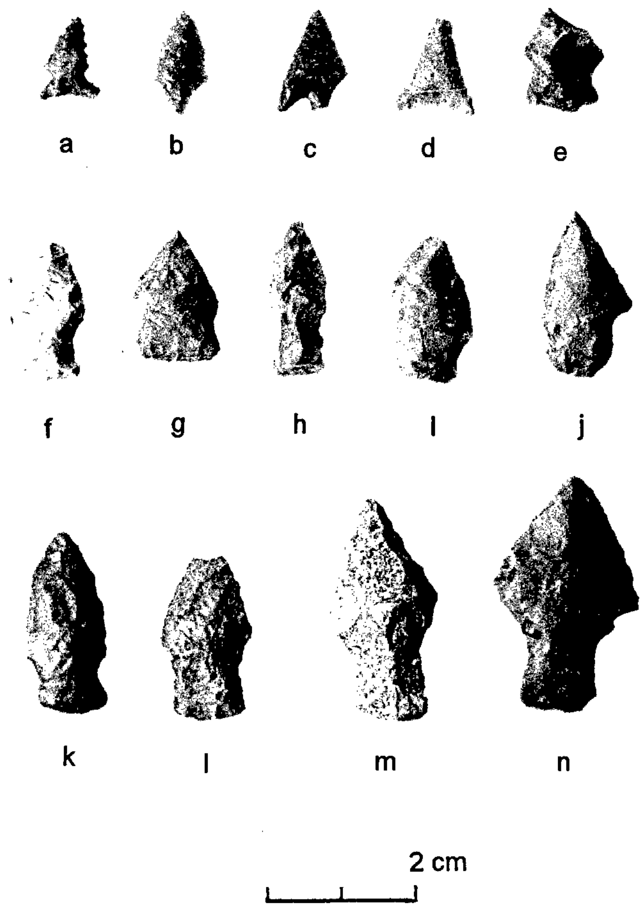


Figure 16.4 Projectile points from 41DN81. Provenience (block/level): a- ST 3; b- 1/2; c- 1/8; d- ST 6; e- 1/2; f- 1/8; g- 1/6; h- 1/2; I- 1/6; j- 1/5; k-m 1/3; n- 1/11.

Feature 1 at this site is much smaller than the feature at 41DN79, and it is generally less than 1 m thick. Nonetheless, its generally circular plan makes its origin difficult to attribute to erosion. This may be the location of a midden that was reused over a considerable period, especially in the Middle Archaic and Late Archaic. Bioturbation may have increased its apparent thickness and depth, and plowing may well have removed any portion of the midden that had positive relief. With respect to contents, however, this portion of the site is a rock-shell midden. Artifact and rock densities are lower than at sites such as 41CO141 or 41DN103, yet 41DN81 is on a stable terrace surface, while the others were situated on aggrading floodplains.

ZOOARCHAEOLOGY

Previous work by ECI at this site resulted in recovery of 185 fragments from four test units from strata as deep as 60 cm below surface (Yates 1985). The collection then was characterized as highly fragmented, with heterogeneous states of preservation even within a single provenience, and there was evidence of mixture with a later historic component.

The identified taxa from testing were virtually duplicated in the mitigation. A summary of bone recovery is presented in Table 16.6.

Table 16.6 Summary of Faunal Material from 41DN81

Block	Total	Identified	Burned
Block 1, Fea. 1	11,700	2,168 (19%)	2,902 (25%)
Block 2, Fea. 2	806	81 (10%)	219 (27%)
Block 2, Fea. 5	3	1	0
Block 3, Fea. 3	1,530	331 (22%)	270 (18%)
Block 3, Fea. 11	1,688	188 (11%)	445 (26%)
Stripped Area 2,			
Fea. 8	29	2 (7%)	6 (21%)
Fea. 14	339	30 (9%)	87 (26%)
Fea. 17	451	92 (20%)	114 (25%)
Backhoe Trenches	13	5	3

The excavations of a historic component at the site indicates that the prehistoric component was disturbed by the historic occupation and cultivation, but stipulates that "in the vicinity of Block 1 is a well-preserved, thick prehistoric midden containing a dense concentration of FCR hearths, used repeatedly over a long period..." (Lebo 1992:342).

As a result of the intermixing of components, very few reliable inferences can be made regarding prehistoric subsistence practices from this assemblage. Furthermore, because emphasis was placed almost entirely on feature recovery, approximately three-fourths of the faunal material came from fine-screened samples, which tend to inflate the counts for rodents and easily identifiable turtle shell. In fact, fully 51% of the entire identified fraction is composed of fragmented turtle shell. Table 16.7 provides a listing of the identified faunas from each feature with prehistoric or historic/prehistoric mixed association.

Even though historic artifacts were encountered to a depth of 80 cm below surface, a few observations can be made about Feature 1 within the context of the prehistoric archaeological investigations. Although two of the marker species for historic components, pig and chicken, are represented in this feature, the remains are primarily pig teeth fragments and three eggshell fragments comparable to chicken. No cattle bones were positively identified, but two large mammalian fragments exhibited cut marks that appear to have been made with a metal implement. One of them may be the remains of a bone knife handle. The remainder of the animals are consistent with those found in prehistoric sites in the study area and with the list of taxa from testing at this site. Therefore, even though domestic animals are represented or suggested, their remains are not abundant.

In addition, three turtle plastron fragments are burned and have cut marks on the interior. These marks result from scraping out the meat from a turtle's shell as in preparing turtle soup. Scraped turtle shell has not been exemplified in any of the prehistoric assemblages in the area. So, at least some of the ubiquitous turtle shell is possibly related to the historic subsistence activities. Therefore, the historic occupation associated with Feature 1 may have been of brief duration and may have occurred early in the historic period when more game animals were consumed in contrast to domesticates.

Feature 2 is another mixed historic/prehistoric feature. Historic artifacts were intermixed and probably originate from the sheet refuse deposit. No domesticated animal remains were recovered. The complement of faunas is consistent with small samples from prehistoric-related features from other sites in the study area. All vertebrate classes are represented, and turtle shell is the most abundant; however, this feature has minimal amounts of deer and rabbit. None of the faunal remains exhibit cut marks, but almost one-third of the fragments are burned.

Feature 3 did not appear to have been intermixed with the historic component. Identified as a storage/refuse pit, it contained about one-tenth the amount of bone as Feature 1, but was considerably smaller than one-tenth the size of that huge feature. Beaver is the only species found in Feature 3 that was not found in Feature 1. Like Feature 1, however, pronghorn and jackrabbit are present; the presence of pronghorn seems to be a distinguishing characteristic of prehistoric features at this site. This feature also produced large amounts of burned and unburned turtle shell, not generally a hallmark of historic features. Besides Feature 1, the only feature thought to have historic affiliation that also had a quantity of turtle remains is Feature 11, which Lebo considered to be the northeast half of Feature 3 (Lebo 1992:347).

Features 5, 8, and 14 are extremely small and have been identified as two postmolds and a hearth. Although the faunal remains from Feature 14 number over 300 fragments, few were identifiable; nevertheless, a vertebrate classes are represented in this small sample, suggesting that it is a microcosm of activities portrayed in larger samples. Feature 17, likewise, contained a little more fragments, but preservation permitted more identified remains, primarily deer bones. Unlike the other three small features, Feature 17 also contained remains of pronghorn, in keeping with its prehistoric associations.

Ten elements have attributes in common with other bone tool fragments from prehistoric contexts in the study area. Three of them have classic awl shaping and fabrication marks. The others are very small broken tool fragments that exhibit polish and use wear or fabrication scars (Table 16.8).

Twelve identified elements from the site had been modified in ways that link them with the historic component. One large mammal bone from Feature 16 had been fashioned into a knife handle, which still retained a bit of rust where the pin fastened the blade to the handle. A knife handle fragment from Feature 1 was too badly deteriorated to determine if it conjoined this one from Feature 16. A rib from a large mammal (pig or cow) from Feature 1 had an oblique slice in the blade, typical of cut ribs from other historic sites. Three pig bones from Feature 1 exhibited cut marks: an axis vertebra had been chopped as in decapitation; a sacrum also had a cleaver chop in the centrum; and a rib had been sawed. This pig rib was recovered deep in level 8 of the feature, suggesting that the historic refuse had been placed in a hole excavated for burying waste. Other cut bone, all from historic Feature 16, includes two cut limb bones of medium-sized birds, probably chickens, and a squirrel calcaneum that displays a skinning cut made with a metal tool. This squirrel element, therefore, is associated with the historic occupation of this site.

Fishing undoubtedly played an important role in subsistence at this site during all occupations. The delicate bones of fishes do not generally preserve unless conditions are favorable. That most features contained some fish bones suggests that many more remains were lost to taphonomic factors or screening methods. Feature 1 has the highest diversity in fish taxa and abundance of fish remains than the other features, but it is not clear whether this is due to preservation, sampling, or cultural activities.

Taphonomically, the bone is extremely weathered and fragmented, with bone surfaces exhibiting exfoliation, cracking, and root etching. Thus, the composition of the identified material, as well as its state of preservation, indicate that the bones have been irretrievably mixed and subjected to destructive agents.

Table 16.7 Faunal Remains from Prehistoric Features, 41DN81

Feature 1 (prehistoric/historic midden) Block 1, lv. 1-12)

Taxon	NISP	MNI
Gar sp.	9	1
Catfish	12	1
Drum	1	1
Bass/Sunfish	1	1
Indet. Fish	48	-
Toad/Frog	24	2

Table 16.7, cont.

cf. Spadefoot Toad	6	1
Bullfrog	1	1
Slider Turtle	33	1
cf. Map Turtle	2	1
Musk Turtle	15	1
Mud Turtle	1	1
Musk/Mud Turtle	34	-
Box Turtle	99	3
Soft-shell Turtle	10	1
Indet. Turtle	897	-
Rat Snake	1	1
Non-poisonous Snake	58	-
Viper	10	1
Indet. Snake	40	-
Domestic or Wild Turkey	1	1
Indet. Bird, large	1	-
Indet. Bird, medium	7	-
Indet. Bird, small	3	-
Cottontail	49	2
Black-tailed Jack Rabbit	12	2
Swamp/Jack Rabbit	4	-
Ground Squirrel	9	1
Fox/Gray Squirrel	1	1
Pocket Gopher	130	9
Pocket Mouse	8	1
Deer Mouse	2	1
Grasshopper Mouse	3	1
Woodrat	2	1
Cotton Rat	18	4
Vole	27	5
Indet. Rodent	125	-
Dog/Coyote	2	1
Carnivore	3	1
Pig	9	1
Deer	197	6
Pronghorn	2	1
Deer/Pronghorn	111	3
Sheep/Goat	8	1
Cow/Bison/Elk	1	-
Indet. Mammal, large	69	-
Indet. Mammal, medium	34	-
Indet. Mammal, small	28	-
Unidentified fragments	9,532 (2902 B*)	

* number of burned fragments

Feature 2 (prehistoric/historic midden) Block 1, lv.2-3

Taxon	NISP	MNI
Bass/Sunfish	1	1
Indet. Fish	4	-
Toad/Frog	1	-

Table 16.7, cont.

Slider Turtle	2	1
Box Turtle	5	1
Indet. Turtle	46	-
Indet. Bird, small	2	1
Cottontail	1	1
Fox/Gray Squirrel	2	1
Pocket Gopher	2	1
Indet. Rodent	2	-
Raccoon	1	1
Deer	6	1
Indet. Mammal, large	4	-
Indet. Mammal, medium	1	-
Indet. Mammal, small	1	-
Unidentified fragments	725 (219 B)	

Feature 3 (prehistoric midden) Block 3, lv.1-4

Taxon	NISP	MNI
Catfish	4	1
Bass/Sunfish	4	1
Indet. Fish	12	-
Toad/Frog	4	-
Slider Turtle	2	1
Musk Turtle	67	1
Musk/Mud Turtle	3	-
Box Turtle	27	2
Indet. Turtle	119	-
Non-poisonous Snake	1	-
Indet. Snake	4	-
cf. Wild Turkey	1	1
Indet. Bird, large	4	-
Indet. Bird, medium	2	-
Cottontail	2	1
Black-tailed Jack Rabbit	1	1
Squirrel	3	1
Beaver	1	1
Pocket Gopher	3	1
Indet. Rodent	5	-
Deer	34	1
Pronghorn	2	1
Deer/Pronghorn	5	-
Indet. Mammal, large	13	-
Indet. Mammal, medium	2	-
Indet. Mammal, small	3	-
Unidentified fragments	1,199 (270 B)	

Feature 5 (prehistoric postmold) Block 2

Taxon	NISP	MNI
Deer	1	1
Unidentified fragments	2	

Table 16.7, cont.

Feature 8 (unknown function) Stripped Area 2

Taxon	NISP	MNI
Indet. Rodent	1	-
Deer	1	1
Unidentified fragments 27 (6 B)		

Feature 11 (prehistoric storage/refuse pit) Block 3, lv. 2-10

Taxon	NISP	MNI
Indet. Fish	3	-
Gar	1	1
Catfish	1	1
Toad/Frog	2	-
Slider Turtle	1	1
Musk Turtle	1	1
Soft-shell Turtle	2	1
Indet. Turtle	80	-
Non-Poisonous Snake	4	-
Indet. Snake	5	-
Cottontail	2	1
Swamp/Jack Rabbit	1	1
cf. Beaver	1	1
Fox/Gray Squirrel	1	1
Pocket Gopher	9	1
Pocket Mouse	2	1
Cotton Rat	1	1
Vole	5	2
Indet. Rodent	18	-
Skunk/Weasel	2	1
Deer	18	-
Indet. Mammal, large	18	-
Indet. Mammal, medium	9	-
Indet. Mammal, small	1	-
Unidentified fragments 1,500 (445 B)		

Feature 14 (prehistoric hearth/refuse pit) Stripped Area 2

Taxon	NISP	MNI
Catfish	1	1
Indet. Fish	1	-
Indet. Rodent	1	-
Toad/Frog	2	-
Indet. Turtle	14	-
Cottontail	1	1
Indet. Rodent	1	-
Deer	3	-
Indet. Mammal, large	5	-
Indet. Mammal, small	1	-

Table 16.7, cont.

Unidentified fragments	309 (87 B)	

Feature 17 (prehistoric/historic hearth) Stripped Area 2

Taxon	NISP	MNI
Indet. Fish	7	-
Slider Turtle	2	1
Box Turtle	9	1
Musk Turtle	1	1
Indet. Turtle	42	1
Cottontail	2	1
Pocket Mouse	1	1
Indet. Rodent	1	-
Deer	20	1
Pronghorn	1	1
Deer/Pronghorn	3	-
Indet. Mammal, large	2	-
Indet. Mammal, medium	1	-
Unidentified fragments	359 (114 B)	

Table 16.8 Bone Tools from Prehistoric Contexts, 41DN81

Provenience	Element	Comment
Fea. 1, lv. 2	long bone splinter	burned mid-tool fragment
Fea. 1, lv. 3	turtle shell frag.	burned, faint scratches on interior
Fea. 1, lv. 4	long bone splinter	burned, blunt tip
Fea. 1, lv. 4	long bone splinter	unburned, blunt tip, w/ring and snap break
Fea. 1, lv. 4	turtle shell frag.	burned, faint scratches on interior
Fea. 1, lv. 8	deer metatarsal	unburned awl w/proximal splinter cylindrical shaft, longitudinal fabrication scars & circumscriptions, heavily gnawed
Fea. 1, lv. 10	long bone splinter	unburned, gnawed, subtriangular, tapers to tip
Fea. 3, lv. 2	long bone splinter	burned, polished, mid-tool fragment
Fea. 16, lv. 3	long bone splinter	burned, conical tip
Fea. 17, gnl.	long bone splinter	charred, cylindrical 3 mm dia., mid-tool fragment

CHAPTER 17
THE CALVERT SITE (41DN102)

INTRODUCTION

The Calvert Site is located on a low Pleistocene terrace on the south bank of Isle du Bois Creek in the southeastern part of the Ray Roberts Lake area (Figure 17.1) . The site area has been extensively disturbed by gravel quarrying, farming, trash disposal, and intensive archaeological investigations over a long period. One of the major objectives of UNT's mitigatoin efforts was to find areas within the site that still had relatively intact deposits that could be excavated and analyzed. This proved to be a challenge, as did excavations following large floods that inundated the lower block.

These efforts were essential, however, because the site appeared to be perhaps the only one in the project area that had evidence of intensive Late Prehistoric occupations, with possible evidence of architecture,

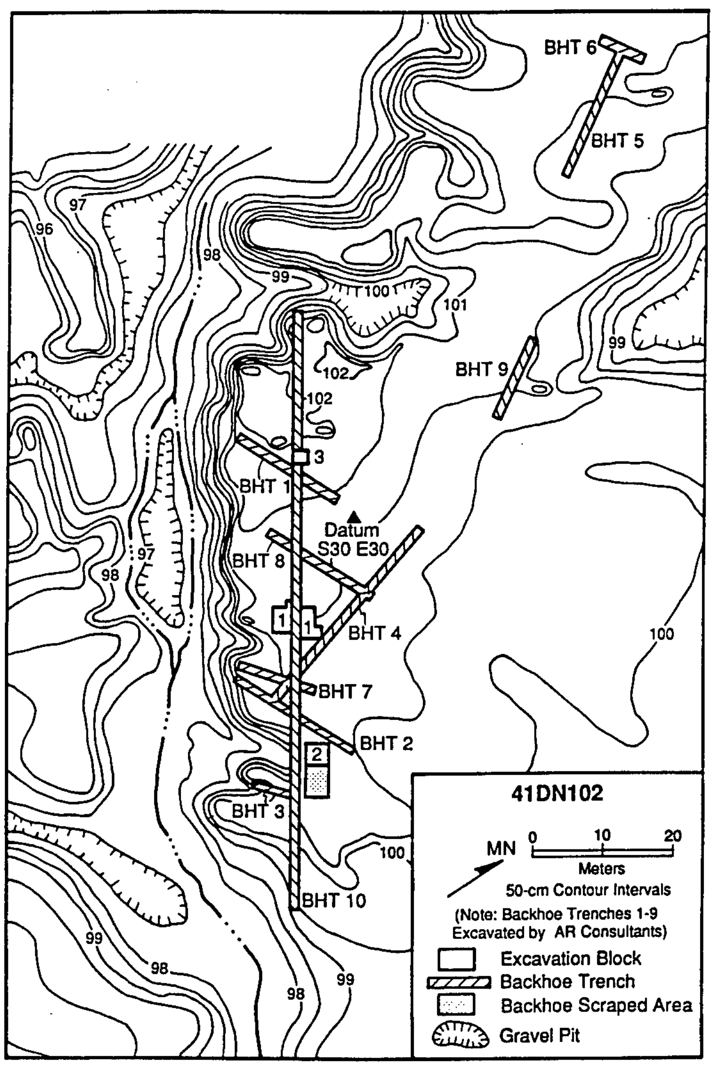


Figure 17.1 Map of the Calvert Site (41DN102) showing excavation areas. Backhoe Trench 10 was excavated during current project; others were excavated by previous investigators.

burials and other features. In addition, ECI test data sufggested earlier components might be preserved in lower deposits off the terrace edge. UNT defined an intact Middle Archaic component there, although only limited work was accomplished because of overall effort allocations and premature reservoir flooding.

Previous Investigations

The Calvert Site may be 41DN15 as reported by SMU in 1972 (Bousman and Verrett 1973). It was recorded in 1980 as 41DN102 by ECI (Skinner et al. 1982a). A diffuse surface scatter of lithic debris, mussel shell, bone, and FCR was observed in addition to several fragments of human bone. A dense concentration of cultural material was observed eroding from a bulldozer cut to a depth of 60 cm bs. Test excavations, conducted by ECI in 1981 (Skinner et al. 1982b), consisted of 15 auger holes, ten 1x1 m test pits, one 1x0.5 m test pit, and one 2x0.5 m test pit. Test unit 8 was placed over a partially exposed human burial. The burial consisted of two individuals that appeared to have been interred together, one above the other. Human remains of one individual were also recovered from test unit 6, and remains of at least two individuals were recovered from the surface. A large sample of lithic debris, projectile points, bone, burned rock, mussel shell, and pottery was collected during this phase of testing. The pottery was assigned to the Nocona Plain type (Skinner et al. 1982b).

Additional testing in 1982 by ECI (Skinner et al. 1982b) included more than 30 auger holes, nine backhoe trenches, 12 1x1 m test pits, two 1x2 m test pits, and two 2x2 m test pits. Burial 3 was recovered from test unit 14. Cultural deposits in the west portion of the site were determined to extend to a depth of 140 cm below surface. The site clearly contained Late Archaic and Late Prehistoric occupations, although their contexts and stratigraphic integrity were not fully defined. Based on results of these investigations further excavation was recommended by UNT in 1986.

SITE SETTING AND GEOLOGY

No detailed geologic investigations were conducted at this site. The upper part of the site is on a Pleistocene terrace (a Denton Creek terrace), and has sandy sediments with a well-developed Alfisol with an anthrogenic A-horizon (Figure 17.2). Sand and gravel occur below the surface soil.

The eroded terrace surface slopes gradually to the floodplain to the west, but has a steep scarp to the north-northeast (Figure 17.1). Towards the western end of Backhoe Trench 10, deeper sediments occur as colluvium at the terrace edge. It was in this area that ECI obtained the older radiocarbon age described below. UNT placed Block 2 there to investigate the possibility of buried Archaic materials. Unfortunately the Block 2 area flooded and collapsed before a detailed geologic section couold be described. The excavators' section (Figure 17.3) shows colluvial sandy loams and loamy sands down to apprioximately level 10 (99.45 m relative to site datum). Below this are lighter (weathered) brown silty sands and loamier sediments that contain Middle Archaic materials. Below level 20 (98.45 m relative to site datum) are redder loams. The Block 2 sediments are interpreted as colluvium-alluvium, that aggraded in early-middle Holocene time, with accumulation of Middle Archaic occupation debris and emplacement of features. During this interval, it is assumed that the terrace surface was stable to eroding.

Geochronology

ECI obtained two radiocarbon ages from the site, including 1,980 +/- 245 BP (UGa-4432) from Test Unit 11, in the western, downslope part of the site and an age of 1,230 +/- 320 BP (Beta-5678) from test unit 25 (ca. 50 cm below surface) associated with Late Prehistoric occupation materials on the higher, terrace portion of the site. UNT obtained an age of 693 +/- 70 BP on charcoal from levels 3-4 (ca. 30 cm below surface) in Block 1, also associated with Late Prehistoric occupation materials. ALthough based on depth below surface, these ages appear to be in stratigraphic order, they cannot be correlated with accuracy because of the overall shallow contexts and because of human and natural disturbance.

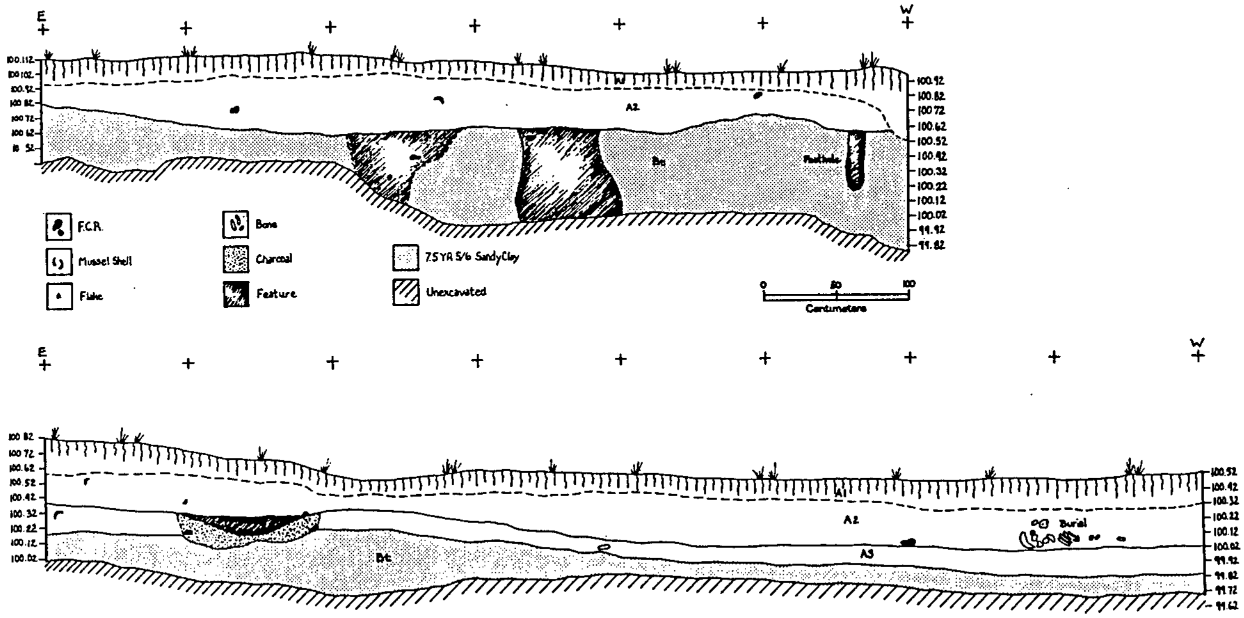


Figure 17.2 Profiles along Backhoe Trench 10, 41DN102.

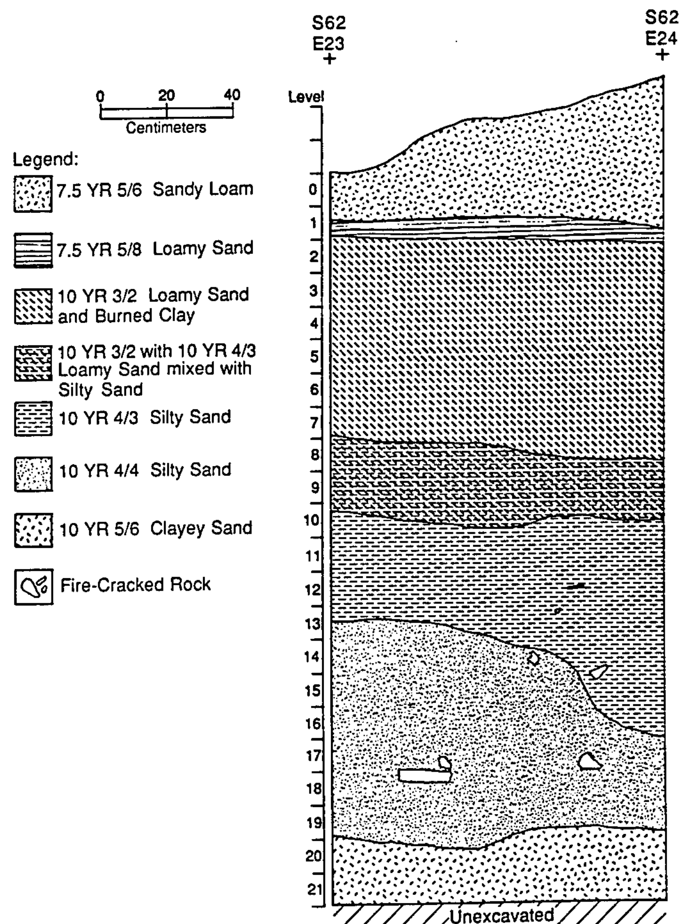


Figure 17.3 Profile of north wall, Unit S63E24, Block 2, 41DN102.

ARCHAEOLOGICAL INVESTIGATIONS

Excavation Strategy

Investigations in 1987 by UNT began with excavation of a backhoe trench through the center of the site for a distance of 85 m. This trench cross-cut many of the older backhoe trenches, none of which had been backfilled. The new trench exposed a long east-west site profile (Figure 17.1). The trench also exposed a trash-filled pit at the east end of the site and a human burial in the center of the site. Based on the materials and features exposed in this trench, and on the objectives of the mitigation, three blocks were established. Blocks 1 and 3 were placed in the upper part of the terrace to investigate the Late Prehistoric occupation horizons there. Block 2 was placed at the western edge of the site to investigate deeper, presumably Archaic occupation horizons in colluvium/alluvium off the terrace edge.

Block 1 was placed in the area of the burial exposed by Trench 1. This block was expanded on both sides of the trench resulting in 25 contiguous 1x1 m units that were bisected by Trench 1. Excavations in Block 1 were shallow, with large quantities of Late Prehistoric remains recovered (Figure).

Block 2, measuring 3x3 m in area, was placed in the western, lower portion of the site where cultural deposits occurred at greater depth in colluvium/alluvium (Figure 17.1). Block 3 measured only 2x2 m in area and was placed over the trash-filled pit exposed at the east end of Trench 1 (Figures 17.1, 17.2).

Cultural Stratigraphy

Features

Thirteen features were found in the three blocks. Ten of the features were in Block 1, while Block 2 and Block 3 had two and one features, respectively. The features in Block 1 (Figure 17.4) were first recognized in two excavation levels: 3-4 (100.66-100.62 m) and 4-5 (100.55-100.50 m). In the upper levels the features consist of three postmolds (Features 3, 4, and 5), three hearths (Features 2, 7, and 8), and one human burial (Feature 1). The postmolds were circular to oval-shaped with organic staining and charcoal. They were from 15-24 cm in diameter and 16-20 cm deep. The sides were straight to slightly constricted with flat or rounded bottoms. Their spatial arrangement does not permit definition of the architectural layout, yet a house is inferred.

Two types of hearths were defined: 1) concentrations of fire-cracked rock (Features 2 and 7), and 2) a shallow stain with sloping sides (Feature 8). Feature 2 consisted of a burned limestone concentration that measured approximately 63x50 cm in diameter with a depth of 20 cm.

Feature 7 was a concentration of burned sandstone measuring approximately 70x50 cm in area with a depth of 9 cm. There was no evidence of a prepared pit nor of in situ burning. It is believed to represent hearth cleaning debris. Feature 8, adjacent to Feature 7, consisted of an organic stain measuring approximately 145x65 cm in area with a depth of 26 cm. One edge of the feature had been removed by Backhoe Trench 1. Associated with Feature 8 were large mammal bone fragments, scattered burned rock, shell, charcoal, and debitage. This is believed to be a roasting pit that was cleaned out, resulting in the formation of Feature 7. Consequently, Features 7 and 8 are interpreted as results of a single event.

Feature 1, an adult human burial, was first revealed by Trench 1 (Figures 17.2. 17.4). The tightly flexed burial was in a prepared pit with organic-rich fill. The body was so tightly flexed that it may have been bound. The pit measured 70x45 cm in area with a depth of 31 cm. The bone was deteriorated and body portions were removed as articulated units and transported to the laboratory.

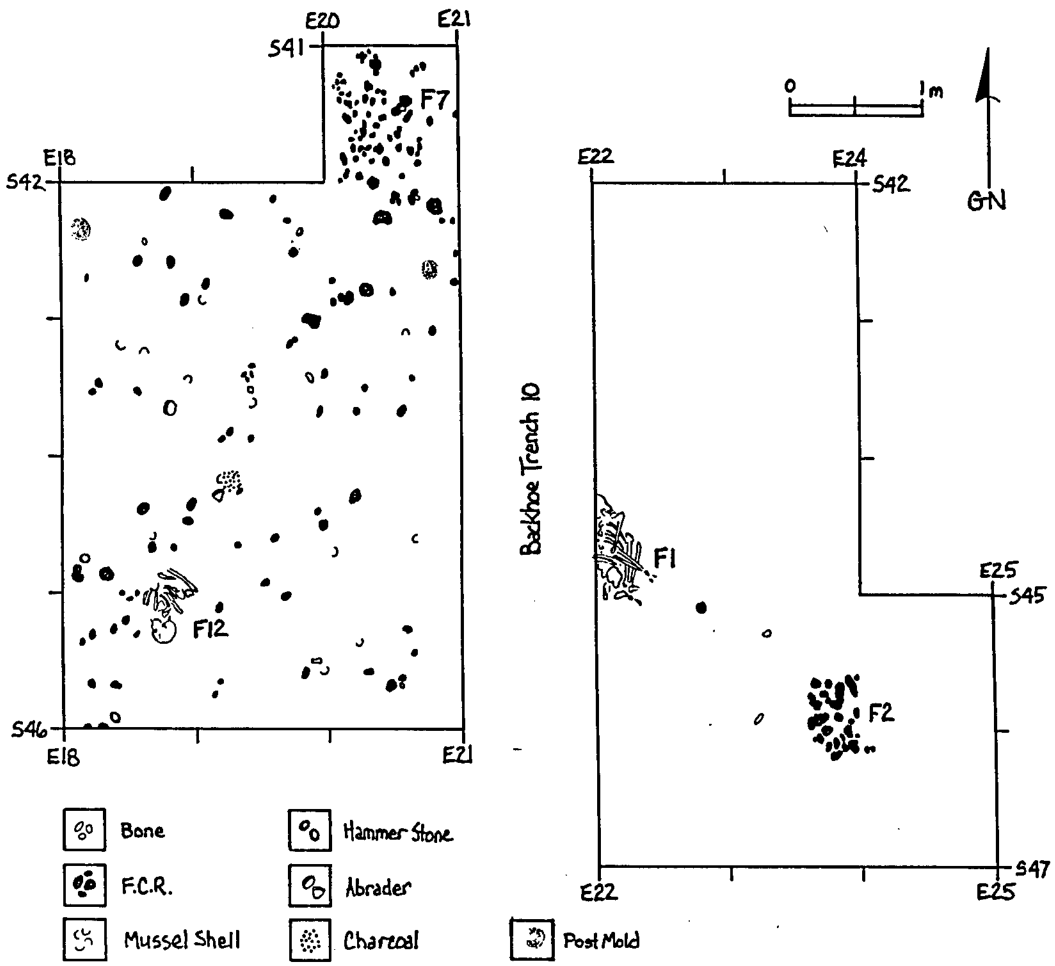


Figure 17.4 Plan of Features, Block 1, 41DN102.

The stratigraphically lower features in Block 1 consisted of two postmolds (Features 6 and 9) and a burial of a child (Feature 12). The postmolds were of the same configuration as those found stratigraphically higher. They measured 13-17 cm in diameter and had depths of 16-17 cm. They also had straight to slightly constricted sides and round bottoms.

Feature 12 is the burial of a child in a prepared pit (Figure 17.4). It was not recognized until level 7. It is believed that the pit originated in level 5. The pit measured 63x44 cm in area, with a depth of 11 cm. A single child, approximately 5-6 years of age, was tightly flexed and lying on its left side. Bone preservation was good. The bone was exposed and removed as a single unit and transported to the laboratory for cleaning and analysis.

Ceramic and debitage distriubutions in Block 1 (Figure 17.5) show minor clustering of ceramics in the eastern portion of the block and a small sherd cluster in the southwestern part of the block. Debitage distruibutions are quite even, with the exception of "false clusters" where finescreening was done in two squares.

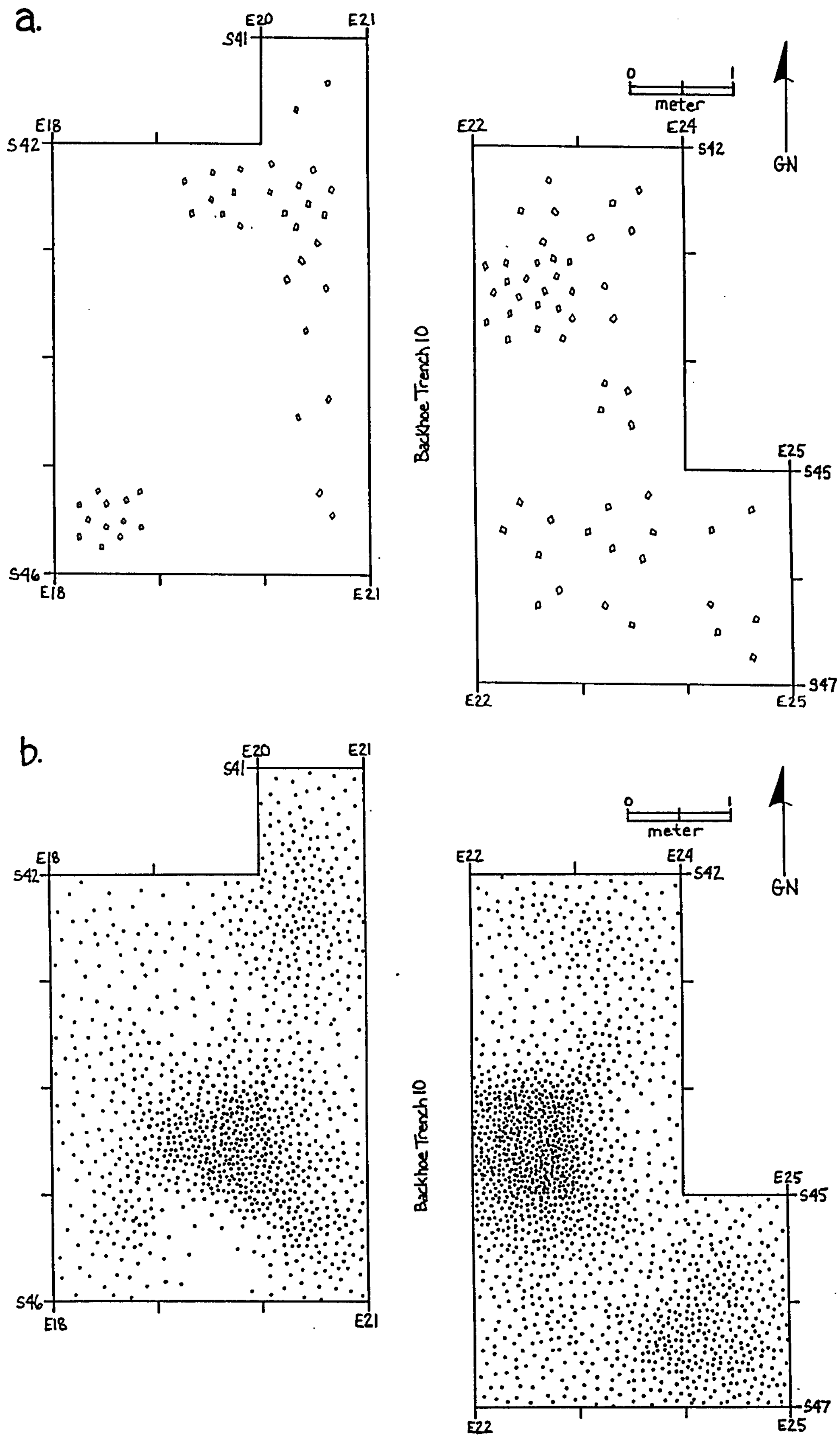


Figure 17.5 Artifact distributions, Block 1, 41DN102. a- ceramics; b- debitage.

Block 2 Features

Two features (Features 10 and 11) were found in Block 2, both from excavation level 16 at a depth of 98.95 cm above site datum (Figure 17.6). Feature 10, an adult human burial, was poorly preserved with the exception of the cranium and mandible. The burial appeared to have been tightly flexed. The living floor from which the burial originated was between levels 14 and 16 (99.15-98.85 cm above site datum). Despite the fact that the burial and the hearth are at about the same elevation, the burial appears to have been emplaced from the hearth paleosurface because of the slope in sedimentary units in this block. However, a burial pit outline could not be defined. The skeletal remains were confined to an area measuring approximately 50x30 cm.

Feature 11 is a rock-filled hearth. Unfortunately no charcoal was found in the hearth area. Lithic debitage and one gouge or gouge blank was found associated with the burned rocks. It is assumed that this hearth was originally in a pit, but no profile could be defined owing to weathering of the sediments.

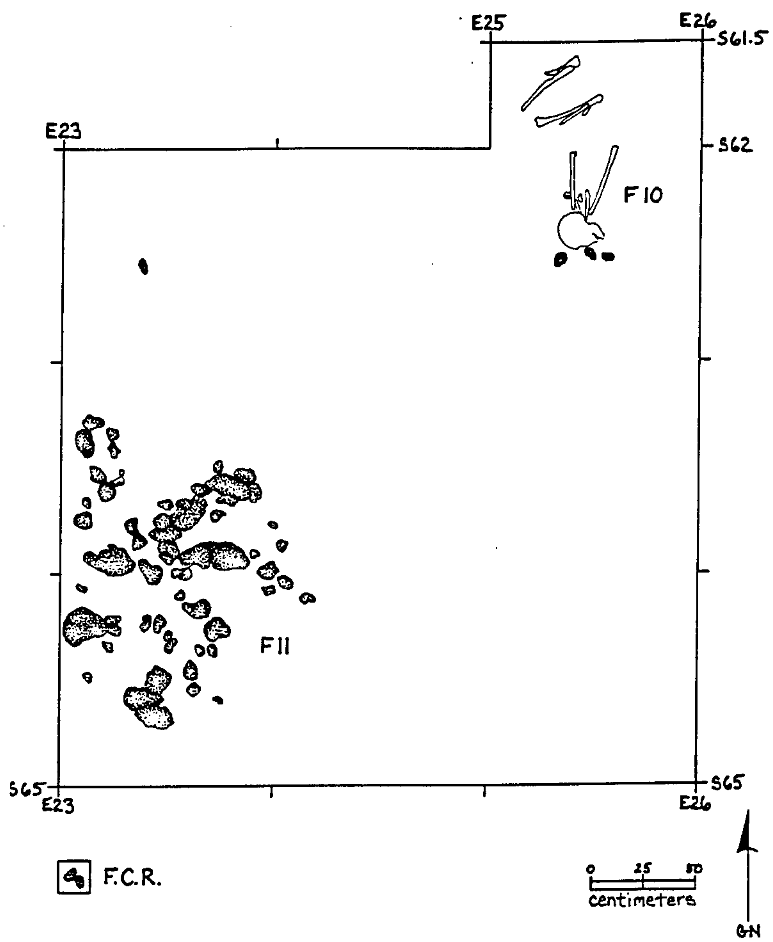


Figure 17.6 Plan of features, Block 2, 41DN102.

Block 3 Feature

Block 3 was placed over an organic stain (Feature 13) that was exposed in Backhoe Trench 1. This feature originated approximately 50 cm below surface and measured 48x14 cm in area with a depth of 48 cm (101.20-100.62 cm bd). Approximately 60% of the feature had been destroyed by Backhoe Trench 1 (Figure 17.2). The origin of the feature was at the contact between the cultural midden and the soil B-horizon. It was bell-shaped with a constricted neck, expanding walls, and basin-shaped bottom. Associated material included bone, rock, burned rock, debitage and charcoal. No internal stratification was noted. Feature 13 is attributed to the Late Prehistoric occupation of the site, and is interpreted as a trash-filled storage pit.

Artifact Assemblages- Blocks 1 and 3

Late Prehistoric and Late Archaic materials were preserved in the areas of Blocks 1 and 3. The assemblage from Block 3 included over 4,800 lithic artifacts and 273 ceramic sherds (Table 17.1). The lithic assemblage, other than debitage is clearly dominated by projectile points. Cores are rare, as is groundstone, and blank-preforms are most common in the upper levels. Debitage is dominated by large pieces, and cortical flakes account for about 20% of the samples, with minor fluctuations (Table 17.2). The rare cores and blank-preforms, as well as the low frequencies of cortical flakes suggest little primary or secondary stages of manufacture took place in this area of the site.

Arrowpoints are restricted to the upper three levels (2-4), which also contain 96.3% of the sherds. However, this is where most of the dartpoints also occur (Table 17.3), suggesting mixture or scavenging. Excavation of features such as burial pits and postholes certainly account for some of the apparent mixture. Below level 5 there are no arrowpoints; this may represent a relatively undisturbed late Archaic occupation, preserved by bioturbation of sediment (cf. Johnson, 1989). The retouched tool assemblage is sparse, with a few scraper types, a drill, a burin and retouched pieces in the upper levels. One scraper and a Clearfork gouge occur in the lower levels of the block. Groundstone includes only a hammerstone, a metate fragment and a piece of ground hematite, all from the Late Prehistoric levels.

Table 17.1 ASSEMBLAGE COMPOSITION, DN102, BLOCK 1

LEVEL	DEB	CORES	BLANK	UNIFAC	PROJ PTS	GRND ST	TOTAL	CERAM
1	834	1	8	3	22		868	94
2	1841	1	7	5	33	2	1889	139
3	885	1	5	1	12	1	905	30
4	703			1	1		705	6
5	279			1	3		283	4
6	142		1		1		144	
7	47						47	
8	16						16	
9				1			1	
TOTAL	4747	3	21	12	72	3	4858	273
PCT	97.72	0.06	0.43	0.25	1.48	0.06		

Table 17.3 ARTIFACT TYPOLOGY- DN102, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	LEVEL 2	3	4	5	6	7	9
BIFACES							
Arrow point	3/4	7/11	-/4				
Dart point	4/5	5/5	3/4	1/-	2/1	-/1	
UNIFACES							
Endscraper		2/1					
Thick endscraper	1/-		-/1				
Double sidescraper							1/-
Drill on flake	1/-						
Clearfork gouge				1/-			
Burin on biface		-/1					
Retouch, unilateral	1/-						
Retouch, dist-lat	-/1						
BLANKS							
Blank-preform	-/8	2/5	1/4		-/1		
Biface fragment	2/4	2/3	1/-				
CORES							
Discoidal flake			-/1				
Core fragment	-/1	1/-					
GROUND STONE							
Hammerstone		-/1					
Metate			1				
Ground hematite		1					
Total	34	48	20	2	4	1	1

Table 17.2 DEBITAGE, DN102, BLOCK 1

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE					
Level	INT	CTX	INT	CTX	INT	CTX	INT	CTX		Chert	Cortex	Large
2	277	7	265	121	39	2	50	17	778	13.88	18.89	58.23
3	335	43	260	139	58	3	60	18	916	15.17	22.16	52.07
4	145	7	157	71	15	3	26	5	429	11.42	20.05	60.37
5	86	5	101	33	20		20	4	269	16.36	15.61	58.74
6	59		67	12	9		16	4	167	17.37	9.58	59.28
7	32		37	12	11		4	2	98	17.35	14.29	56.12
8	13		13	7	3		3	3	42	21.43	23.81	61.90
9	4		2	1	1		2		10	30.00	10.00	50.00

The projectile point assemblage includes several types (Table 17.4; Figure 17.7), none of which are dominant in frequency. Scallorn forms only occur in levels 3 and 4, yet this is not taken as evidence for stratification but more likely is related to small sample size. Supposedly later forms such as Perdiz are in levels 2 and 3. Most arrowpoints are made on Ogallala quartzite, suggesting local acquisition of raw material, or scavenging of older bifaces for remanufacture into arrowpoints.

Gary dartpoints are more common in the upper levels, as are all dartpoints, but earlier forms such as Calf Creek tangs and side-notched are mixed (Figure 17.7; Table 17.4). Raw materials for dartpoints are about evenly divided between chert and quartzite, although the few pieces from deeper levels suggest more use of chert.

Artifact densities in Block 1 are quite high (table 17.5), and they increase in the upper levels. Mussel densities are quite low throughout, especially compared to bone. Burned rock from hearths is very high in the upper levels as well.

The artifact samples from Block 3 are very small (Tables 17.6, 17.7). Both recovered arrowpoints are made on quartzite, whereas two of the other tools are made of chert. The higher chert frequency in debitage from level 2 is suggestive of real spatial variation, yet the small samples preclude any strong conclusion.

Table 17.4 PROJECTILE POINT TYPOLOGY- DN102, BLOCK 1
(x/x = chert/quartzite)

CLASS/Type	**LEVEL**						
	2	**3**	**4**	**5**	**6**	**7**	
ARROWPOINTS							
Scallorn			1/1	-/1			
", serrated		2/-					
Perdiz	1/1	-/1					
Alba/Catahoula		4/-					
Bonham		-/1	-/3	-/2			
Indeterminate	1/1	-/6	-/1				
", serrated	1/1						
Total	7	18	4				
Pct Chert		43	39	0			
DART POINTS							
Gary	1/2	2/3	-/2		-/1		
Elam	-/1						
Ellis		1/-					
Godley		-/1	1/-				
Morrill					1/-		
Kent-like drill			1/-				
Yarborough					1/-		
Calf Ck frag	1/-	1/-					
Side notched				1/-			
Indeterminate	2/2	1/1	1/2	-		-/1	
Total	9	10	7	1	3	1	
Pct Chert		49	50	43	100	67	0

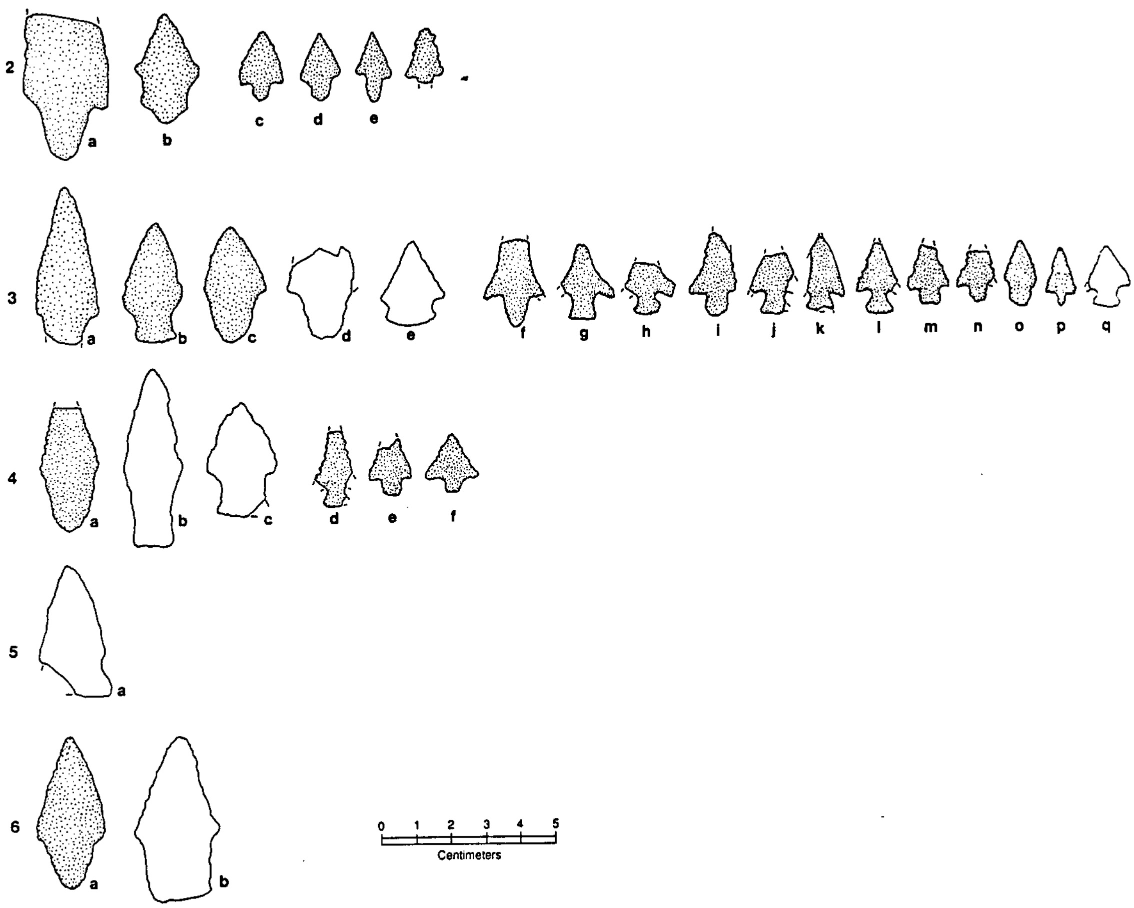


Figure 17.7 Projectile points from Block 1, 41DN102.

The ceramics from Block 1 are all plain sherds, and with few exceptions are very small fragments. Single grit tempered sherds were found in levels 2 and 3, and level 3 yielded a sherd with no temper. All other sherds in the sample have shell temper and are ascribed to the Nocona Plain type. Only 13 small rim sherds were found, all of which have simple rounded lips. Only eight plain, shell-tempered sherds were recovered from Block 3 (Table 17.6).

Artifact Assemblages - Block 2

Excavations in Block 2 yielded one of the more important assemblages in the project area. It is unfortunate that the character of these assemblages was not appreciated earlier, and also that flooding precluded further excavations in this part of the site. Levels 2-4 yielded Late Prehistoric materials (Table 17.8). Levels 5-10, between this component and the deeper Middle Archaic zones were tested and most fill was then discarded so that more time could be spent excavating the deeper horizons. Levels 11-24 yielded Middle Archaic materials and features (Table 17.8).

The Late Prehistoric samples are small, but include debitage with quite high chert frequencies (Table 17.9). The few tools recovered include a possible Perdiz and two Bonham arrowpoints from level 3. From the same level is a small regional chert bifacial drill on a flake and an Edwards chert bifacial knife fragment; the

Table 17.5 ARTIFACT DENSITIES, DN102, BLOCK 1

level	debden (n/m3)	artden (n/m3)	mussden (gm/m3)	rockden (g/m3)	boneden (n/m3)	% burned
2	311.20	319.60	21.60	6539.60	181.60	29.74
3	366.40	380.00	78.40	12161.60	424.00	36.79
4	171.60	176.80	79.60	5252.00	298.00	30.34
5	107.60	108.40	37.20	8472.80	170.40	42.72
6	66.80	68.40	11.20	1318.80	108.80	38.60
7	140.00	141.43	10.00	1888.57	98.57	39.13
8	105.00	105.00	0.00	152.50	22.50	39.13
9	33.33	36.67	0.00	213.33	6.67	39.13
Mean	193.93	199.10	39.67	5938.90	213.56	36.22
Std Dev	108.41	113.68	30.57	4083.88	131.34	4.27

Table 17.6 ARTIFACT TYPOLOGY, DN102, BLOCK 3

TYPE	LEVEL 2	3	4
ARROW POINTS			
Alba	-/1		
Scallorn	-/1		
End scraper			-/1
Burin on biface			1/-
Retouched blade			1/-
Blank-pre	-/1	-/1	-/1
Ceramics	6	2	

'-/- CHERT/QUARTZITE

Table 17.7 DEBITAGE, DN102, BLOCK 3

	QUARTZITE				CHERT							
	SMALL		LARGE		SMALL		LARGE			Chert	Cortex	Large
level	INT	CTX	INT	CTX	INT	CTX	INT	CTX	N	%	%	%
2	27	2	27	9	11		15	1	92	0.29	0.13	0.57
3	10		11	5			3		29	0.10	0.17	0.66
4	7		3	1					11	0.00	0.09	0.36
5	8		8	1			1		18	0.06	0.06	0.56

Table 17.8 ASSEMBLAGE COMPOSITION, DN102, BLOCK 2

level	DEB	CORES	BLKS	UNIF	PROJ	Total	CERAM
2	31					31	2
3	373			2	3	378	12
4	22					22	3
5	39					39	
6	47					47	
7	30					30	
8	35					35	1
9	46				1	47	
10	39					39	
11	81		1		1	83	
12	168	1	3		1	173	
13	179	2	1		1	183	
14	198				3	201	
15	176	1	2	3	2	184	
16	156	2		1	1	160	
17	158			3	2	163	
18	145	2	1	3		151	
19	108	1	1	3		113	
20	65			3		68	
21	41		1		3	45	
22	26			1		27	
23	15			1		16	
24	35	1			1	37	
						0	
Total	2213	10	10	20	19	2272	
Percent	97.40	0.44	0.44	0.88	0.84		

Table 17.9 DEBITAGE, DN102, BLOCK 2

	QUARTZITE				CHERT					INDICES		
	SMALL		LARGE		SMALL		LARGE					
LEVEL	INT	CTX	INT	CTX	INT	CTX	INT	CTX	TOTAL	Chert %	Cortex %	Large %
2	6	0	9	7	4	0	4	1	31	29.03	25.81	67.74
3	190	14	83	39	30	0	10	7	373	12.60	16.09	37.27
4	8	1	5	1	6	0	1	0	22	31.82	9.09	31.82
5	20	1	13	2	1	0	1	1	39	7.69	10.26	43.59
6	11	2	21	4	2	0	6	1	47	19.15	14.89	68.09
7	14	0	8	3	3	0	2	0	30	16.67	10.00	43.33
8	17	0	9	1	3	0	4	1	35	22.86	5.71	42.86
9	26	0	12	3	2	0	2	1	46	10.87	8.70	39.13
10	18	1	14	4	1	0	1	0	39	5.13	12.82	48.72
11	30	0	26	12	3	0	8	2	81	16.05	17.28	59.26
12	80	1	43	11	14	0	16	3	168	19.64	8.93	43.45
13	70	1	60	18	20	0	7	3	179	16.76	12.29	49.16
14	97	1	48	9	21	1	17	4	198	21.72	7.58	39.39
15	92	2	42	10	14	0	14	2	176	17.05	7.95	38.64
16	66	1	46	12	10	0	19	2	156	19.87	9.62	50.64
17	88	1	29	7	13	0	16	4	158	20.89	7.59	35.44
18	74	1	39	15	4	0	11	1	145	11.03	11.72	45.52
19	49	0	20	11	13	1	11	3	108	25.93	13.89	41.67
20	21	1	15	12	6	0	10	0	65	24.62	20.00	56.92
21	13	0	15	4	3	0	6	0	41	21.95	9.76	60.98
22	6	0	6	7	1	0	4	2	26	26.92	34.62	73.08
23	5	0	4	1	2	0	2	1	15	33.33	13.33	53.33
24	26	0	3	0	5	0	1	0	35	17.14	0.00	11.43

Table 17.10 Artifact Typology, 41DN102, Block 2

TYPE	LEVEL 3	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Bifacial drill	1/-*														
Bifacial knife	1/-					1/-				1/-					
Unifacial knife								1/-							
End-sidescraper										1/-					
Sidescraper								1/-	-/1						
Denticulate						1/-	-/1								
Unilateral retouch									1/1		-/1		1/-		
Bilat. retouch								1/-			-/1				
Clearfork gouge										1/-	1x			-/1	
Gouge preform						1x									
CORES															
Sing. plat. flake							1/-		1/-						
Mult. plat. flake						-/1	1/1		1/-						
Core fragment			1/-	-/2						1/-					-/1
Blank-preform		-/1	1/2	-/1		1/1			-/1	-/1		1/-			
TOTAL	2	1	4	3	0	6	4	3	6	5	3	1	1	1	1

* chert/quartzite
x ferruginous sandstone

Table 17.11 PROJECTILE POINT TYPOLOGY, DN102, BLOCK 2

TYPE	LEVEL 3	9	11	12	13	14	15	16	17	21	24
ARROW POINTS											
Perdiz?	-/1										
Bonham	1/-										
Bonham, serr.	1/-										
DART POINTS											
Frio						-/1					
Kent							-/1				
Calf Creek?								1/-			
Trinity									1/-		
Carrollton?									1/-		
Wells										-/1	
Untyped		1/-	-/1	1/-	1/-	1/1	-/1			1/1	-/1
TOTAL	3	1	1	1	1	3	2	1	2	3	1
Pct Chert	67	100	0	100	100	33	0	100	100	33	0

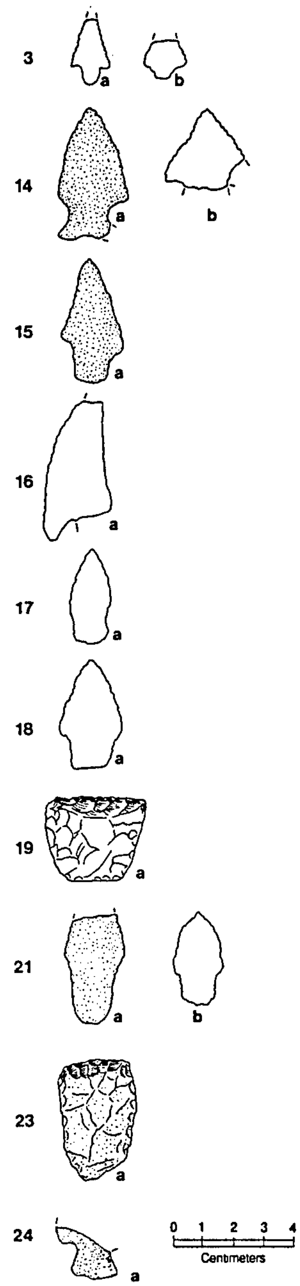


Figure 17.8 Tools from Block 2, 41DN102.

latter appears to be a reworked dartpoint rather than a formal knife type. Eighteen sherds were found in Block 2 (Table 17.8). Two grit-tempered sherds were found, one each from levels 3 and 8. Both of these sherds have fingernail punctations, and appear to be from the same vessel. These are the only decorated sherds from this site. All the other sherds from Block 2 are plain and shell-tempered.

Despite the small excavation area, a significant Middle Archaic component was preserved in this part of the site. The material occurs between levels 11 and 24 (99.45-98.35 m relative to site datum) suggesting a moderate period of accumulation. Without radiocarbon control, however, it is not possible to accurately estimate the age or duration of these occupations. Samples from any given level are small. Only modest frequencies of chert are represented in the debitage samples (Table 17.9), with a range from ca. 11% in level 18 to ca. 26% in level 19. Large flakes are more common in the lower levels.

Retouched tools include several kinds of scrapers (mostly sidescrapers) and denticulates (Table 17.10). Unifacial and bifacial knife fragments are also present between levels 15-19. Clearfork gouges include specimens made on local ferruginous sandstone (cf. quartzite), a thick piece on Ogallala quartzite in level 23 and a regional chert example from level 19 (Table 17.10; Figure 17.8). The latter specimen is not typical of other Clearfork gouges. It is made on a biface with an asymmetric plano-convex cross-section and has a steeply bevelled straight working edge. It does not have the weak polish on the ventral surface common to typical Clearfork gouges. The gouge from level 15 is made on an Ogallala quartzite flake blank, and has steep bilateral retouch and a steep bevelled working edge; it is also atypical for the Clearfork gouge type. The gouge from level 15 is actually a large preform, made on a tabular piece of ferruginous sandstone. The ferruginous sandstone piece from level 20 is a typical Clearfork type. Two of the retouched pieces are made of Edwards chert, one a bilaterally retouched blade fragment and the other a unilaterally retouched flake.

The blank-preforms are all in the dartpoint size range; 7 of the 10 blank-preforms are made of Ogallala quartzite. Five of the 11 cores are made of regional chert, including several large multiple platform flake cores. These are the largest pieces of chert recovered on this project, and probably attest to deep burial that precluded scavenging and reuse by later occupants. A large core (54x49x34 mm) from level 18 is made of material similar to Novaculite, yet cortex shows it was made on a stream-worn cobble blank.

The projectile point sample is small but quite interesting (Table 17.11, Figure 17.8). Except for untyped forms, there are only single examples of any given type. Basal and/or stem grinding is present on the Frio, Trinity, Carrollton, Wells types and also on an untyped expanding stemmed fragment from level 24 (Figure 17.8). A single example is somewhat similar to Calf Creek, but the flatter tangs and fragmentary nature leave other classifications, such as Marshall, a possibility (Figure 17.8, level 16); this piece is made on Edwards-like dark grey chert. Overall, 50% of the points are made of regional chert, the rest are Ogallala quartzite. Except for the point just mentioned, no Edwards chert or other extra-regional cherts types are present (but note Edwards chert retouched pieces, mentioned above). Two chert fragments from levels 12 and 13 appear to be fragments of the same point.

Overall, this appears to be an intact Middle Archaic assemblage that was protected from mixture and scavenging by colluvial burial. As such, it is the only example of an assemblage of this period at Ray Roberts. The projectile point assemblage is small, but diverse, suggesting either a) significant stylistic variation characterized the Middle Archaic here, b) fair time range in the stratigraphic section here, or c) possible admixture from older occupation debris from the terrace above. Nonetheless, the point types present conform quite well to estimated assemblage compositions by Prikryl (1990) who suggested Carrollton, Wells and basal notched forms characterized the Middle Archaic. The Trinity point here appears to be in good context, although this type is present in later sites such as 41CO150. Morphological subdivision of this type, or acceptance that the type persisted for a considerable period needs to be considered.

ZOOARCHAEOLOGY

Previous work at 41DN102 (Skinner and Baird 1985) resulted in recovery of 1,000 bones representing 15 taxa from 13 units and various test auger holes. The sample was composed primarily of large, well-preserved fragments of deer or deer-size animals; a few bison-size teeth fragments were recovered from below 40 cm below surface. Twenty-eight per cent of the bones were burned (Yates 1983).

From the current project, a total of 19,664 bones was recovered from three excavation blocks emplaced at 41DN102. Fully one-half of that total came from Block 1 alone. Figures 17.9-17.11 plot the vertical frequency of faunal remains from these three blocks. Backhoe Trench 10 produced 35 identified elements, adding no new taxa to the lists (Tables 17.12-14). On average, 12% of the recovered faunal remains were identified to some taxonomic category, and the taxa lists from this study and the previous work are virtually identical.

In Block 1, the vertical distribution of faunal remains shows a definite increase in levels 3-5 (Figure 17.12). Forty taxonomic categories (including indeterminate) comprise the identified faunas from this block, attesting to the rich faunal diversity available to the site occupants through time in the Isle du Bois Creek Valley. All of the five major vertebrate classes are represented and may be summarized as four genera of fishes, one amphibian, four genera of turtles and two families of snakes, two genera of birds, and 13 genera of mammals; some of the remaining mammalian taxa could be identified only to the level of order or family.

In Block 3, out of a little over 1,500 bones, 25 taxa were identified (Table 17.13). Level 2 produced the most faunal remains, but levels 3 and 5 had slightly higher numbers of identified taxa if not higher numbers of identified specimens. Mixing or downward migration probably accounts for the elevated counts in the upper levels. Overall, the faunal composition throughout Block 3 is similar to the other Blocks, but not as diverse. An increase in faunal concentrations in level 8 is from the bell-shaped pit at that locus. Level 8 added no new taxa to the list, containing reduced quantities of slightly fewer taxa than seen in the other levels; notably absent is any trace of bison, and deer is represented by only one element. Recovery of animal bone was enhanced by fine-screening this feature, with the deer bone, rodents, rabbit, turtle, and one small fish in the identified fraction. A human burial was found in this pit, the excavation of which probably caused inclusion of animal bones from other deposits into the pit fill.

The vertical distribution of animal bones in Block 2 is shown for the lower part of the block (Figure 17.11). Discard of most of the matrix from levels 4-11 and excavation of fewer units account for the loss of data from the upper levels (Table 17.14). Concentrations of faunal remains are apparent from level 14 through level 20 with a peak at level 17, and possibly again at level 22. The identified fraction (Table 17.14) confirms the observations for the last two concentrations: 1) an increase in the number of taxa for levels 14 through 20 with a peak of 19 taxa in level 17, and 2) an elevated number of taxa for level 22. In all of the levels above level 13, there are only 60 identified specimens, and therefore no reliable inferences can be made for those upper levels in Block 2.

The bulk of the faunal remains were recovered in the middle levels of Block 2, from levels 14-20. The artifacts in this zone are Middle Archaic in age; therefore, the fauna from these levels represent unique subsistence information for this time period, not only in the Ray Roberts Lake area, but virtually for the whole north central Texas region. The composition of taxa, though, is much the same as that seen at other sites and other time periods in the study area. Within Block 2, however, this occupation zone contains many taxa not identified in levels above and below it. For example, all of the fishes and aquatic turtles in Block 2 come from this zone. Likewise, canids and furbearers are exclusive to this zone. Bison is possibly present, but this observation is made only on the basis of one specimen of bovid tooth enamel. Deer is identified in each level of the zone, but not in great numbers even when the deer/pronghorn category is included. Of these 32 deer and deer/pronghorn elements, 27 are cranial, and all but a few are from meaty elements of the fore or hindquarters. Over half of the deer bones are burned; most burned elements are cranial or lower limb, as would be expected if roasting whole sections of a carcass. Only one cut mark was noted on deer bones from Block 2, and this was a cut mandible from level 21.

Table 17.12 Identified Taxa, DN102, Block 1

	LEVEL								
	0-1	2	3	4	5	6	7	8	9+
Gar				3	1				
Catfish	1		1	7	7	1	1		
Drum					1				2
Buffalofish					1				
Indet. Fish, sm	3	1	3	5	18	3			
Indet. Fish, lg			3	4	1				
cf. Woodhouse Toad					1				
Soft-shell Turtle			1	1					
Slider Turtle		1							
Stinkpot Turtle					1				
Musk/Mud Turtle			1		7				
Box Turtle		4	11	14	12		1	1	
Indet. Turtle	3	18	99	58	43	13	2	2	1
Non-ven. Snake			1	1	3				
Viper				1	1				
Indet. Snake				1					
Turkey			3	3	2				
Indet. Bird, sm			1	1					
Indet. Bird, med				1	2				
Indet. Bird, lg			2	2	2	1		1	
Cottontail	10	2	35	67	44	23	8		4
Jack Rabbit				2			3		
Beaver				1					
Tree Squirrel	1		3		3	1			
Pocket Gopher	5		3	4	12	2	3		
Cotton Rat	5		3	8	12	2	1		
Woodrat	1								
Vole				1	7	1			
Deer Mouse	1		1	2			1		
Pygmy Mouse					1				
Indet. Rodent	3		27	22	31	6	5		1
Dog/Coyote					1				
Carnivore	1								
Raccoon			1	1	2				
Deer	6	11	46	29	25	12	2	1	2
Pronghorn		1			2				
Deer/Pronghorn	3	20	80	68	61	31	8	1	2
cf. Bison		1	1	1					1
Indet. Mammal, sm	1	1	3	6	9	3		1	
Indet. Mammal, med		5	40	22	15	5	1		
Indet. Mammal, lg	1	5	21	6	26	13			
NISP	45	70	390	342	354	117	36	7	13
# of Taxa	15	12	24	29	31	15	12	6	7

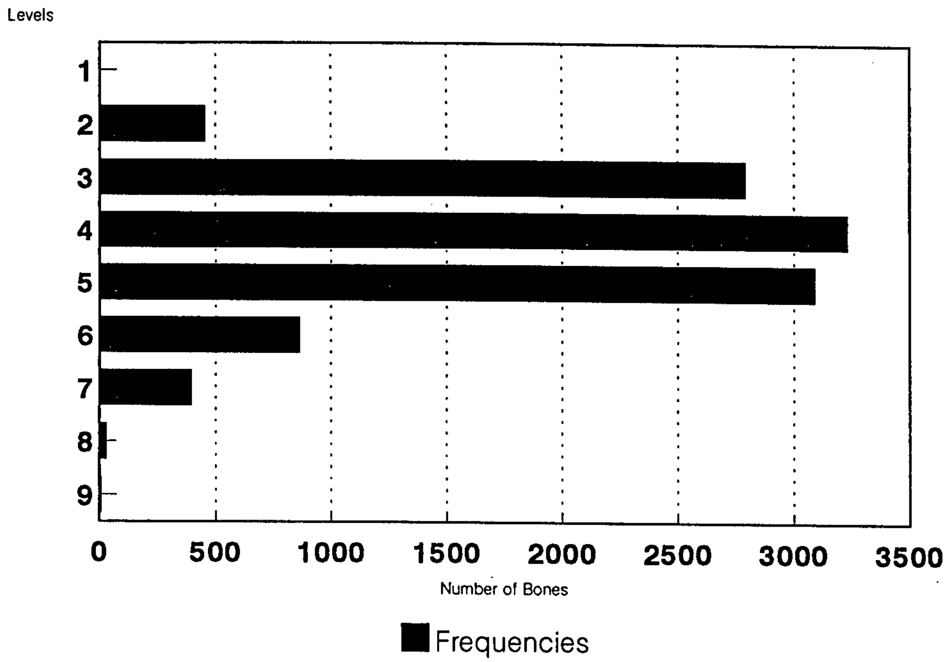
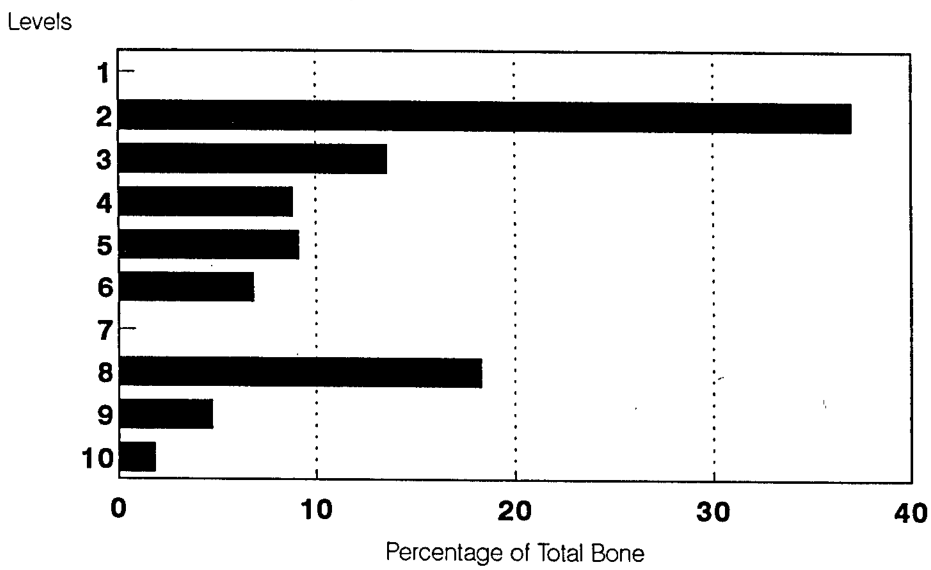


Figure 17.9 Relative frequency of total bone, Block 1, 41DN102.



Bone counts for each level expressed as
% of total bone recovered from block.
Total bone recovered = 1,812

Figure 17.10 Relative frequency of total bone, Block 3, 41DN102.

Table 17.13 Identified Taxa, DN102, Block 3

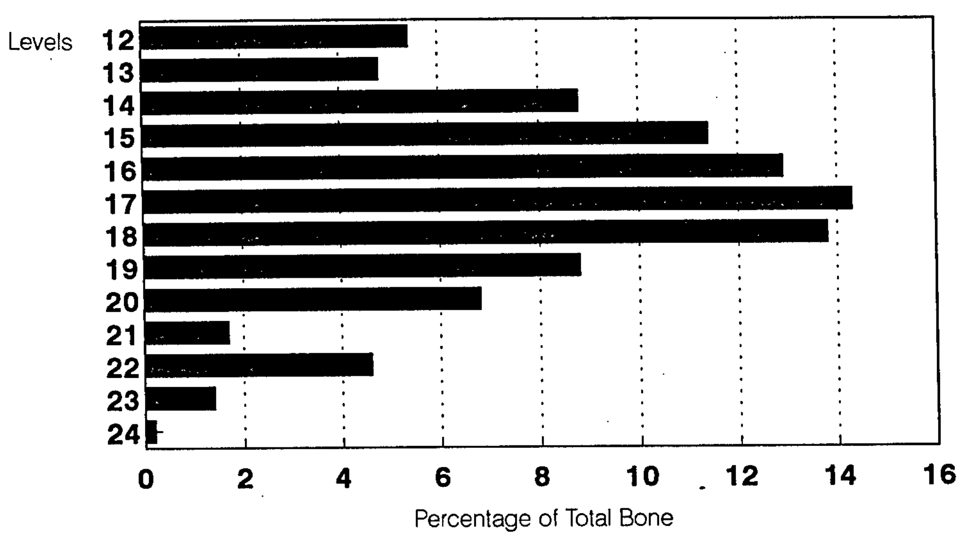
	LEVEL								
	2	3	4	5	6	7	8	9	10
Indet. Fish	2			2	13		8		
Catfish			1		2				
Musk/Mud Turtle		2		1					
Snapping Turtle	1								
Box Turtle	16	5	2	9			1		
Indet. Turtle	25	10	5	1			1		
Non-ven. Snake		1	1						
Turkey		1							
Raptor	1	1							
Indet. Bird, med			1						
Cottontail	14	6	4	4	4		6		3
Beaver			1	3					
Tree Squirrel	1								
Pocket Gopher				2	1		1		
Cotton Rat					1		1		
Slider	2	3		3			2		4
Jack Rabbit	1								
Indet. Rodent		1	2	1			1		
Raccoon		1							
Deer	10	5	4	2			1		
Deer/Pronghorn	26	13	4	6					
cf. Bison		1							
Indet. Mammal, sm				2					
Indet. Mammal, med	2	1		3					
Indet. Mammal, lg	5	1	3	6			2		
NISP	106	52	28	45	21	0	24	0	7
# of Taxa	13	15	11	14	5	0	10	0	2

As at other prehistoric sites in the project area, each occupation zone at 41DN102 is dominated by the remains of the triumvirate taxa: deer, cottontail, and turtle. Of note in the lower levels of Block 1, cotton rats are numerous, estimated at five individuals out of only 15 bones. This suggests that these rodents' remains are not natural deaths, otherwise, there would be more elements from each carcass. Cotton rats are drawn to trash middens and could have been captured there and processed much like squirrel. Cotton rats weigh about half as much as squirrel and are active year round (Davis 1974).

In each block, more individuals for cottontail are indicated than for jack rabbit, although the ratio of jack rabbit to cottontail is much higher in the Middle Archaic zones of Block 2 (Table 17.14). They both prefer a variety of the same habitats as are found in the study area today, such as mixed grass uplands, open areas in the bottomlands with scattered thickets or shrub patches (Caire et al. 1989). From the presence of moderate amounts of burned rabbit bone (about 25%) and their association with hearth areas, these species were clearly major components of the diet at the Calvert site through time. In Block 1, levels 3-5 each contained at least two cottontails, with another two individuals present in the fill from Feature 8 (Table 17.15). In level 17 of Middle Archaic zone in Block 2, there are at least two cottontails. Like deer remains, the rabbit assemblage in each component is composed primarily of cranial and lower limb elements; and similarly, these are the elements that most frequently exhibit charring or calcination from roasting.

Table 17.14 Identified Taxa, DN102, Block 2

	LEVEL														
	<10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Gar						1									
Catfish						1	1		2	1					
Drum								1							
indet. Fish, sm						1	1						1		
Soft-Shell Turtle							1		1						
Slider Turtle					1										
Musk/Mud Turtle											1				
Box Turtle						1		7	2					2	
Indet. Turtle	4	2	2	3	7	4	8	13	10	8	8			1	
Viper								1							
Indet. Snake								2	2				1		
Hawk				1											
Turkey								1							
Indet. Bird, med									1	1	1				
Indet. Bird, lg								1							
Cottontail			3	4	4	10	5	10	16	20	14	2	5		1
Indet. Rabbit					2	3		1		1	1	1		1	
Jack Rabbit	1				4	3	1	3	8	6	4	2	1		
Pocket Gopher				1	6	2	4	1	5			3	2		
Cotton Rat					2		1	3	2	1	3		2		
Vole									2				1		
Deer Mouse										1	1				
Indet. Rodent		1	1	2	2	1	12	6	12	7	9	1			
Fox					1										
Dog/Coyote						3	2		2		1				
Carnivore								1							
Raccoon											1			1	
Deer		1	9	8	6		4	5	4	2	1		1		
Deer/Pronghorn	6		2	3		2	2	3	1	1	1	2	6	1	
cf. Bison	2						1						1		
Indet. Mammal, sm	1	1		1	4		8	9	2	3			1	1	
Indet. Mammal, md	3	1	3	1	1	13	8	4	8	1	2	1	1		
Indet. Mammal, lg	6		11	2	3	11	4	14	1	2	7	2		2	
NISP	23	6	31	26	43	56	63	86	81	55	55	14	23	9	1
# of Taxa	7	5	7	10	13	14	16	19	18	14	15	8	12	7	1



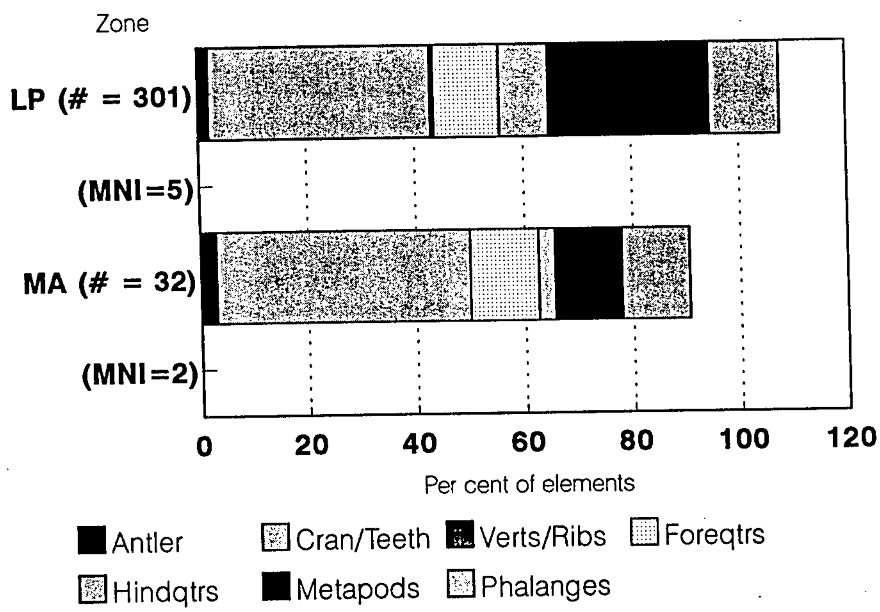
Bone counts for each level expressed as
% of total bone recovered from block.
Total bone recovered = 7,003.

Figure 17.11 Relative frequency of total bone, Block 2, 41DN102.

As mentioned above, a variety of turtles is represented in each of the three blocks. This is a characteristic of the prehistoric sites at Ray Roberts. But compared to other study sites, there are fewer fragments of turtle remains here, yet the variety of turtle taxa is somewhat higher at Calvert. For the entire site, five different kinds of turtles were recognized in the identified samples. More individuals of the terrestrial box turtle were estimated, but this may be a factor of their distinctive osteology. Turtle shell does not figure as prominently in the features of this site as it does in sites such as 41CO150 and 41CO141. However, 43% of the turtle shell from features at 41DN102 is burned.

Pronghorn was identified in the assemblage by three elements in Block 1. It is present, but based on these low counts of diagnostic elements, the importance of this deer-size mammal is considered minimal. Bison, too, is tentatively identified and is listed for all three blocks, but like pronghorn, counts are very low (less than two in a level), and only tooth fragments and phalanges were recovered. Once again, deer appears to be the animal that provided the most consistent source of meat to the site occupants over time.

In the Late Prehistoric zone of Block 1 (levels 3-5) at least five deer are estimated from 301 elements. Figure 17.12 shows that most of these elements are teeth fragments and metapodials (which include carpals and tarsals). Cut marks occur mostly on hindquarters and tarsals in positions that indicate skinning and dismembering. Cuts also occur on a scapula associated with Feature 1 and on a hyoid from Feature 8. The latter cut would indicate removal of the deer's head. Very few vertebrae were recovered; however, recovery of representative elements from the entire carcass indicates that the whole animals were butchered on site. The vertebrae are not particularly durable elements, and their scarcity here may be a preservation effect. Almost one-third of the deer bones exhibit burning; most are heavily charred, although a few are calcined.



LP=Late Prehistoric in Block 1 (lv 3-5)
MA=Middle Archaic in Block 2 (lv 14-20)

Figure 17.12 Vertical distribution of deer carcass parts, 41DN102.

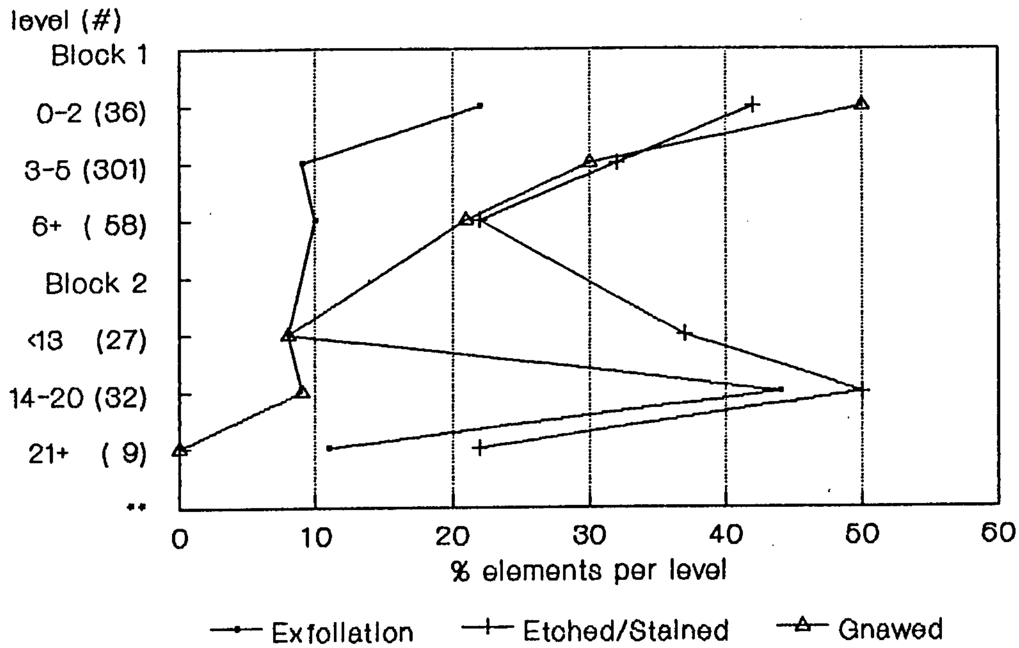
In the Middle Archaic zone of Block 2, two deer are estimated from only 32 elements. The two samples from these temporally separated blocks are proportionately similar in the survival of fore and hindquarters as well as teeth, but differ significantly in the representation of metapodials. This difference can be attributed to carcass processing practices in which the metapodials from the Middle Archaic zone are not as fragmented as those from the Late Prehistoric component. The Middle Archaic peoples may have curated the metapodial shafts for tool fabrication, making and disposing of the tools elsewhere; no modified metapodials were recognized in the Block 2 bone samples (Table 17.16). Metapodial splinter tools were recovered in level 6 of Block 1 and in level 3 of Block 3, however. Other butchering differences observed in the Block 2 assemblage is the near absence of cut marks, the only one being a slight cut on a metapodial from level 21. In contrast, the deer samples associated with the Late Prehistoric components in Blocks 1 and 3 exhibited cut marks on many limb elements.

To compare the taphonomy of the Late Prehistoric and Middle Archaic zones at this site, both blocks are presented in Figure 17.13, where Late Prehistoric is attributed to levels 3-5 of Block 1 and Middle Archaic is attributed to levels 14-20 of Block 2. Even though the sample sizes differ radically, relative positioning of the taphonomic categories within each chart possibly reveals some patterning. For instance, the percentage of elements exhibiting each of the three taphonomic categories in Figure 17.13a show a decline with depth of burial for Block 1; but in the Middle Archaic zone of Block 2 the pattern reverses with depth. This pattern suggests a possible paleosurface (with high bone deterioration) near the upper part of the Middle Archaic zone, as suggested in the discussion on geology. Another contrast is apparent in the percentage of elements exhibiting gnawing. Gnawing seems to have been more common on bones from Block 1 than it does in Block 2. In both blocks, as has been noted at other sites, the three categories track each other throughout the levels.

Sample size does not seem to be a factor in the relative effects of burning and severe deterioration on the bone specimens (Figure 17.13b). For example, in Block 1 there is an increase in deterioration with depth of burial, which one would expect in a non-calcareous soil where older bone has had a longer time to degrade. Again, we see a contrast between Late Prehistoric and Middle Archaic in percentages of elements exhibiting these taphonomic effects: in Block 1, levels 3-5, greater than 30% of the bones are either burned or severely deteriorated, but slightly more display effects of severe deterioration (massive exfoliation, farinaceous or abraded appearance, friable splinters). Just the opposite is the case in the Middle Archaic zone of Block 2 where burning is high and deterioration is relatively low (19%). Burning causes bone to be a bit more durable, and deep burial impedes deterioration, both of which seem to be the case in the Middle Archaic zone.

Burning and fragmentation both affect how many bones survive to be identified. While charring toughens bones, complete calcination may render the bone subject to pulverization, and incineration makes bone into ash. Therefore, there is a continuum of burn conditions in any archaeological faunal sample that stem from a variety of human behaviors and site formation processes. Similarly, a variety of causes of bone fragmentation have been at work on a bone sample: marrow extraction, bone grease rendering, gnawing, trampling, weathering, etc. The elements that get identified have often been through one or several of these processes and activities. Interpretation, therefore, is impaired by incomplete knowledge of the taphonomic history of each bone.

Using the numbers of deer elements in each category, some inferences can be made. For example, Table 17.17 furnishes the percentages for subsets of burned bone for the Late Prehistoric and Middle Archaic components. Deer bone is burned in proportion to the amount of burned bone for each of the blocks containing either component. The Middle Archaic component, however, contains relatively more burned deer and total bone, but much less burned bone in the identified fraction. This suggests that the way animal carcasses were cooked or disposed of involved much firing of their bones, either by roasting whole or partial carcasses or by incineration as a means of refuse disposal. In the later component, these same activities may also have been performed, but a look at fragmentation patterns for each component reveals very different treatment of deer carcasses (Figure 17.F6). The percentages for articular fragments are very close between the two components, but there is a much higher percentage of shaft fragments and of whole elements or complete articular ends in the Late Prehistoric than in the Middle Archaic. Teeth, the most durable element of all, survived best in the older component as expected, but since deterioration is not indicated as a major cause (because of rapid



Blk 1 (3-5) = Late Prehistoric
Blk 2 (14-20) = Middle Archaic

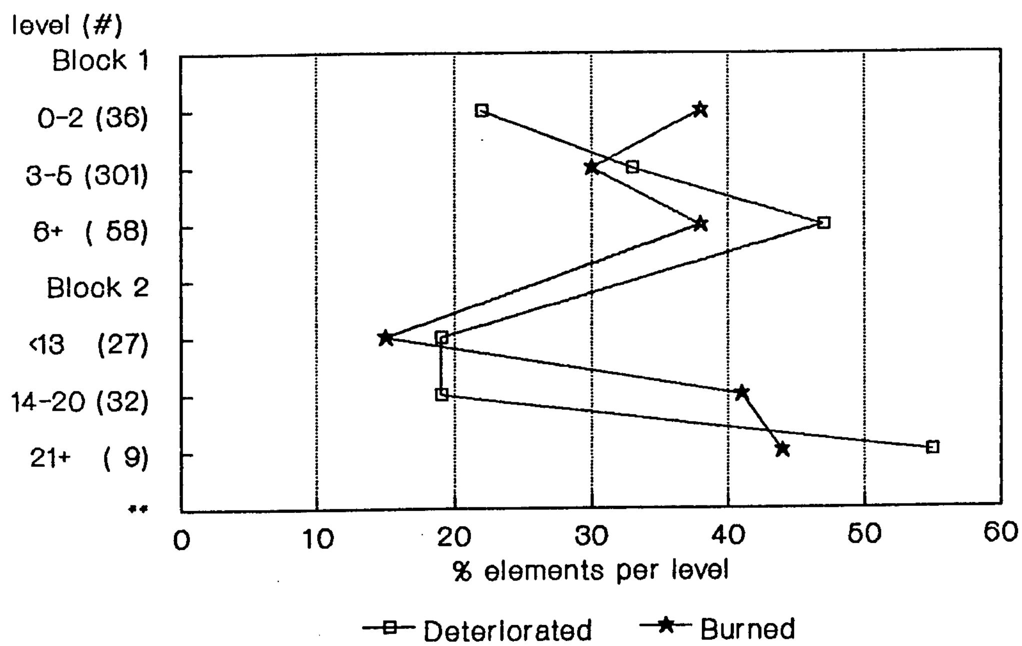


Figure 17.13 Taphonomy of post-cranial deer elements, 41DN102.

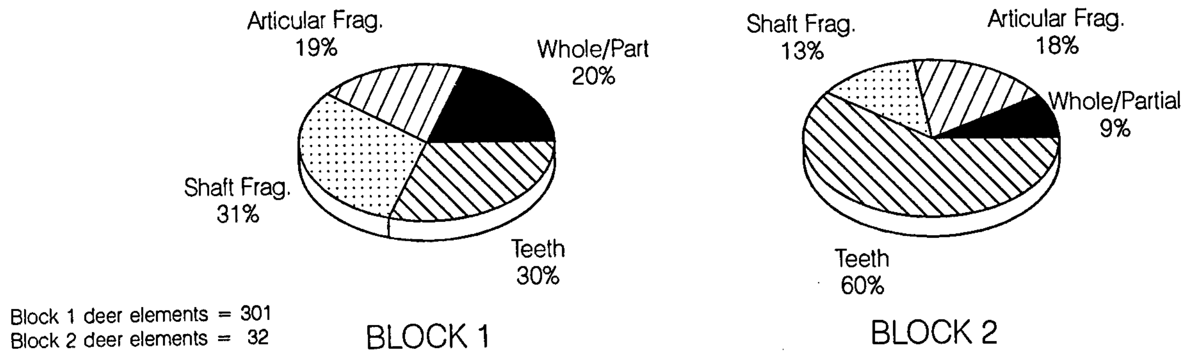


Figure 17.14 Breakage patterns of deer elements, 41DN102.

burial), something else must account for the lack of post-cranial remains in the Middle Archaic component. Perhaps the bulk of the bone was incinerated or disposed of elsewhere.

Table 17.17 Percentages of Burned Bone in Late Prehistoric and Middle Archaic Components, 41DN102

Fraction	LP	MA
Deer Elements	30	41
Identified Sample	28	11
Block Total	32	48

These observations suggest that the Middle Archaic occupation differs from the Late Prehistoric in the way deer was processed and consumed, and most certainly, in the way the site was formed. During the Middle Archaic period, the site was apparently occupied less frequently and/or less intensively. Deer carcasses were apparently roasted with little primary butchering, and the refuse probably lay exposed to weathering agents on the surface or was deposited during warmer times of year, thus enhancing initial degradation. Middle Archaic deteriorated bone is less abundant, perhaps because after some period of exposure (initial degradation), this area of the site was deeply buried by colluvium and alluvium, thus protecting the bone over time and retarding further deterioration.

The opposite scenario is supported by the taphonomic observations for the Late Prehistoric bone samples. The densities of bone are greater in the Late Prehistoric horizons, suggesting more intensive use of the site. Early stages of bone weathering are not represented in high frequencies (cool-season deposition?), but highly deteriorated bone is prominent. This might seem to be a contradiction, but bones in this category may show deterioration, not from advanced stages of weathering, but by being predisposed to weathering or leaching from having first been boiled. As mentioned above, in these levels, bone fragmentation is higher, and there are more unburned fragments; these are characteristics of an assemblage that has been rendered for bone grease. However, since bone gnawing (carnivore and rodent) is expressed in greater frequency in this zone, some of the fragmentation may be a result of non-cultural agents, such as dogs, coyotes, squirrels and gophers.

The Late Archaic occupations at the site, represented by the lower levels in Block 1, have faunas with higher bone deterioration (despite similar levels of burning) than in the Late Prehistoric samples (Figure 17.13). The Late Archaic sample also exhibits low exfoliation, low gnawing and low etching/staining compared to the Late Prehistoric materials. In these respects the Late Archaic faunas exhibit a taphonomic history that is different from either the Late Prehistoric or the Middle Archaic: the bones are younger than the Middle Archaic,

Table 17.16
Bone Tools and Modified Mussel Shell, 41DN102

Block (lv) Unit	Element	Comment
1 (3) S45/E20	fragment	burned, tip section, 6 mm long x 2 mm diameter, polished
1 (4) S44/E19	metacarpal	unburned, anterior splinter, deer longitudinal fabrication scratches
1 (4) S43/E21	ulna	unburned, proximal end deer w/transverse cut marks, long deep scratches (fabrication?), badly gnawed
1 (5) S44/E21	splinter	unburned, flat, mid-tool w/deep oblique cuts
1 (5) Fea. 8	fragment	unburned, tooth of comb?
1 (5) Fea. 8	fragment	burned, mid-tool, faint striae, medullary cavity smoothed and polished
1 (6) S45/E24	metatarsal	unburned, anterior splinter, longitudinal fabrication scratches
2 (19) S64/E25	fragment	burned, pointed terminus, 3 mm diameter
3 (3) S21/E23	metapodial	unburned splinter, mid-tool section
1 Bur. 1 Fea. 1	valve	elliptical hole in umbone
1 (5) Fea. 8	shell bead	unburned, tubular, 1.4 cm length x 6 mm diameter
3 (5) S21/E22	valve frag.	triangular w/hole

but were buried more deeply than the Late Prehistoric faunas. Thus they show higher deterioration (because of greater age and moderate burial depth in porous sediments) than the Middle Archaic faunas, but lower gnawing, etching and staining than the Late Prehistoric faunas because of deeper burial. Thus, burial depth as a part of overall geologic site history, is important in explaining the patterns of bone taphonomy here.

Nevertheless, these differences demonstrate how site formation processes (depth of deposit, soil permeability, slope) as well as cultural activities impact faunal samples. Differences in amount of gnawed bone suggests that scavengers and rodents had greater access to the shallow Late Prehistoric bone deposits but not to the bone in the deeper, more clayey soils of the Middle Archaic component. Or, possibly Late Prehistoric people may have had dogs in camp, and perhaps the Middle Archaic people did not. Further, there are indications that the Late Prehistoric occupants practiced bone grease rendering, which was not obviously done during the Middle Archaic occupations.

Faunal Summary

In conclusion, the Calvert site faunas exhibit distinctive patterns in the faunal remains of two temporally distinct culture periods that have not heretofore been apparent in a single site in north central Texas. While the composition of taxa may remain static through time, other clues to subsistence behavior may be seen in the distribution of elements for particular species and in the taphonomic characteristics and histories of bones themselves.

Table 17.15 IDENTIFIED FAUNA FROM FEATURES, DN102

Feature 1 (Block 1, lv. 3-5), human burial	
catfish	6
bass/sunfish	2
indet. fish	31
slider turtle	8
box turtle	3
indet. turtle	33
non-poisonous snake	2
viper	1
raptor	1
wild turkey	1
cottontail	41
squirrel	1
pocket gopher	6
deer mouse	1
woodrat	1
cotton rat	9
vole	2
indet. rodent	12
white-tailed deer	10
deer or pronghorn	12
mammal small	6
mammal medium	12
mammal large	5

Feature 2 (Block 1, lv. 4-5), hearth	
indet. fish	2
catfish	1
drum	1
indet. turtle	1
cottontail	7
squirrel	1
pocket gopher	8
cotton rat	2
cf. pygmy mouse	1
vole	3
indet. rodent	5
white-tailed deer	1
deer or pronghorn	1
mammal large	1

Feature 4 (Block 1, S43/E20), postmold	
cotton rat	4

Feature 7 (Block 1, lv.4), hearth cleaning debris	
indet. fish	1
catfish	1
indet. turtle	1
cottontail	2
cotton rat	1
vole	1
indet. rodent	1
white-tailed deer	1
mammal medium	1

Feature 8 (Block 1, lv. 4-6), hearth	
fish small	20
gar	3
catfish	5
box turtle	1
indet. turtle	18
non-poisonous snake	2
wild turkey	2
bird large	1
bird medium	1
cottontail	42
jack rabbit	1
fox squirrel	1
pocket gopher	3
cotton rat	7
vole	4
indet. rodent	20
white-tailed deer	6
deer or pronghorn	12
mammal small	8
mammal medium	4
mammal large	13

Feature 9 (Block 1, S43/E19), postmold	
indet. rodent	1

Feature 10 (Block 2, lv. 14-17), human burial	
drum	1
indet. turtle	4
indet. snake	1
cottontail	5
swamp or jack rabbit	1
pocket gopher	3
indet. rodent	6
jack rabbit	2
carnivore	1
mammal small	5
mammal medium	2
mammal large	16

Feature 11 (Block 2, lv. 16), hearth cleaning debris	
fish small	1
indet. turtle	3
cottontail	4
jack rabbit	1
pocket gopher	3
cotton rat	1
indet. rodent	3
dog/coyote	1
white-tailed deer	4
mammal small	5
mammal medium	1

Feature 12 (Block 1, lv. 5-7), child burial	
indet. turtle	1
cottontail	3
squirrel	1
pocket gopher	1
cotton rat	1
indet. rodent	2
carnivore	1
white-tailed deer	5
mammal large	1

Feature 13 (see Block 3), bell-shaped pit

SUMMARY

Investigations at the Calvert Site revealed evidence of Middle Archaic, Late archaic and Late Prehistoric occupations. The Middle Archaic materials were exposed in a small deeper block off the terrace edge. These contained one hearth and a single burial of an adult male. The lithic assemblage indicated on-site tool manufacture from local quartzites, local ferruginous sandstone and regional chert. A variety of dartpoint styles, scrapers and Clearfork gouges characterize the assemblage. Vertebrate faunas show a focus on a variety of riparian, forest and prairie faunas. The few bison tooth enamel fragments are not considered evidence of bison procurement, since they are such durable elements, and are prone to redeposition from suprajacent terrace deposits. Faunas from the Middle Archaic occupations are generally similar to those from the Late Archaic and Late Prehistoric contexts. But the Middle Archaic faunas have a higher proportion of small game, possibly indicating a paucity of large game and/or a more intensive, generalized foraging strategy. Without radiocarbon ages it is difficult to associate these Middle Archaic occupations with regional evidence for drier Middle Holocene climates. These assemblages could possibly date as young as 5,000-4,000 BP, when climatic amelioration had begun, or they could date to the full Middle Holocene when both resource density and composition may have been different.

Late Archaic occupations are not well preserved, but occur below Late Prehistoric horizons on the terrace surface. Small tool and fauna samples suggest no gross differences in activity or subsistence from the Middle Archaic patterns. Late Prehistoric faunas are also similar, suggesting foraging economic pursuits. Isotopic data (Gill-King, this volume) show no evidence for use of domesticates in the Late Prehistoric period here. Nonetheless, evidence for architecture, storage pits and high artifact densities suggest greater occupational intensity or reoccupation frequency in the Late Prehistoric period at this site. Lithic and ceramic assemblages show no affiliation with Caddoan groups to the east, but rather with Late Prehistoric groups indigenous to this part of the Southern Plains.

CHAPTER 18 GEOARCHAEOLOGICAL SUMMARY

GEOLOGIC CONTEXTS OF ARCHAEOLOGICAL SITES

Archaeological sites in the Upper Trinity River Drainage Basin occur in two principal contexts: on terraces and on/below the floodplain. Lower site densities occur in upland settings and in colluvial slope deposits. Some sites have been found in alluvial fan sediments, but these settings have not been surveyed intensively.

Understanding the geomorphic and stratigraphic positioning of archaeological sites is essential for site prediction and site discovery. The same information is necessary for interpreting site locations and site densities with respect to past settlement intensities and settlement patterns. At another scale, site contexts are principal components of site formation analyses that focus on reconstruction of occupation patterns within sites. The data on site contexts from Ray Roberts are thus an important aspect of the archaeological record there, and also can be used to assist in planning future research in this region.

The alluvial stratigraphy and geochronology described in this report is a key to major site contexts. All of the terraces along the Trinity between Dallas and Valley View appear to be late Pleistocene. Therefore, any sites of Clovis and younger age (less than 11 ka), can occur on terrace surfaces. Survey data on hundreds of archaeological sites in Denton, Dallas and Tarrant Counties, including surveys at Ray Roberts Lake, support this view (Prikryl 1990; Lebo and Brown 1992). The vast majority of recorded sites occur on terraces, where they are most easily found. Individual sites (actually "locations" is a more appropriate term here) may contain lithic artifacts that range from Paleoindian to Late Prehistoric and even historic periods. The Wheeler Site (41DL30) is a good example (Crook and Harris, 1952; 1954; Albritton and Patillo, 1940). Located on a Denton Creek terrace surface, this site contains Dalton, Plainview, San Patrice, "basal notched", Trinity, Gary, Dallas, Fresno and Washita point types, among others (Prikryl, 1990). Most of the artifacts occur in the sandy A horizon of the soil that formed in the Carrollton Alluvium.

Survey data from Ray Roberts show that 70% of the sites located during the ECI survey are located on the terraces of the Trinity and its tributaries (Skinner et al. 1982a; Table 18.1). The survey methods did not include subsurface exploration of the flood plain nor shovel testing, indicating that both the number and character of the recorded sites are probably biased estimates.

Distance from water, proximity to lithic raw materials, and past distributions of food resources were probably key determinants of site locations. In the Late Prehistoric period, arable soils may also have played a role in settlement location decisions, although horticulture appears to have been a minor economic focus in this area (Peter and McGregor 1988). Study of terrace site distributions can provide important data on past settlement patterns. Indeed, because of long-term surface stability, terrace site distributions should be useful to monitor geographic shifts in settlement locations. This kind of investigation has been initiated by Prikryl (1990).

The ages of sites on or below the floodplain can be predicted according to their stratigraphic position (Table 18.2). Because of poor cutbank exposures (especially along the Elm Fork of the Trinity) and because the alluvial units tend to thicken downstream, older sites should be increasingly difficult to locate in downstream floodplain sediments. Buried sites ranging from Paleoindian to Middle Archaic may be extremely difficult to find without mechanical excavation, and near Dallas they may be obscured completely by thick alluvial fill.

The Late Holocene Pilot Point Alluvium is widely exposed in the entire drainage basin. Along present meanderbelts, Pilot Point alluvium is usually exposed in cutbanks. While lateral accretion deposits are prevalent, flood basin facies and cut-off channel fill deposits are also exposed. At Ray Roberts, both Late Archaic and Late Prehistoric sites have been found in separate channel fills of Late Holocene (Pilot Point Alluvium) age (see chapters on 41CO150 and 41CO144). These sites include stratified cultural deposits with

Table 18. 1 SITE AGE AND GEOMORPHIC SETTING, LAKE RAY ROBERTS
Data from Skinner (1982) Survey

SITE AGE	SITE SETTING					
	1st Terrace	2nd Terrace	Flood Plain	Upland	Total	%
Late Prehistoric	10		3		13	0.12
Late Archaic+Late Prehistoric	8		2	1	11	0.10
Late Archaic	16	2	3	3	24	0.21
Middle Archaic+	3				3	0.03
Quarry	7	2		2	11	0.10
Indeterminate	27	4	8	11	50	0.45
Total	71	8	16	17	112	
%	0.63	0.07	0.14	0.15		

numerous hearths. Presumably shelter was sought in these depressions during occupations. That successive occupation horizons were buried by flood deposits indicates that these abandoned channels were filling in over the period of repeated occupations. In distal flood basin settings, the Pilot Point Alluvium is thick, dark and clayey. Sites are difficult to find and excavate in these settings.

Both Late Archaic and Late Prehistoric sites have been found in colluvium and alluvial fan sediments along the Elm Fork Trinity River Valley, although none were studied during mitigation stages of work at Ray Roberts. Stratigraphic studies at one fan (Ferring, 1990e; 1993) show thick late Holocene sediments overlying a truncated soil that appears to be either middle Holocene or late Pleistocene in age. A buried soil occurs in the late Holocene fan sediments that is probably correlative with the West Fork soil, but has not been dated yet. Thick recent sands cover the buried soil. This example suggests that fan growth was greatest in the late Holocene, slowed ca. 2 ka, and was probably renewed in the post-settlement period as a result of land clearing.

SITE SURVIVORSHIP AND VISIBILITY

A major question associated with analysis of any multi-site regional data base is: how many sites of a given age have survived as part of the archaeological record? Of course the real number of sites of a given age cannot be known, and at best, the survivorship issue can be dealt with qualitatively. However, identifying the relative potential for survivorship, and the contexts of differential survivorship potentials can assist in present interpretations as well as future archaeological surveys in the region.

Although recent land use activities, both private and public, play a major role in site disturbance and destruction, only natural factors are considered here. The erosion of sites can result in varying degrees of disturbance or total loss. The patterns of erosion are defined mainly by the topographic setting of the site and

Table 18.2 Geocultural Stratification Contexts at Ray Roberts

I. Stable Surfaces with Pseudoburial

Terraces: Subsequent Sites

1. Stable surface with unrestricted reoccupation potential.
2. Permeable loamy to sandy sediment: neutral to acid pH
3. Pseudostratification by progressive downward artifact translocation ("diffusion"), via bioturbation, pedoturbation, trampling. Pseudoburial of artifacts and features by upward sediment translocation (eg. worms, insects)
4. Between stage serial occupations registered by artifact types present and changing ratios of "stage-diagnostic" artifacts with depth; within-stage serial occupations impossible or difficult to isolate
5. Feature associations often ambiguous; highly varied to bimodal faunal preservation, including potential loss of most older fauna, depending on ages of occupations; high artifact densities possible, high stone/bone ratios common.
6. Paleoindian to Historic occupations

II. Aggradational Settings with Depositional Burial

A. Terrace-Floodplain Margin

1. Rapid to moderate aggradation of alluvium and colluvium from adjacent terrace
2. Loamy colluvium mixed with calcareous floodplain clay
3. Geologic stratification via burial with reduced turbation potential
4. Good potential to isolate within-stage serial occupations as well as between-stage stratification
5. Feature associations clear; faunal preservation varies according to age and depth of horizons; low artifact densities; varied stone/bone ratios
6. Middle Archaic to Late Prehistoric occupations (deeper sediments with older occupations possible)

B. Floodplain Settings

1. Moderate to slow alluviation
2. Calcareous clayey alluvium
3. Moderate geologic stratification, with moderate turbation potential
4. Moderate to poor potential to isolate within-stage serial occupations; good to moderate potential to segregate between-stage serial occupations
5. Feature associations generally clear; faunal preservation improves with depth of burial; artifact densities proportionate to activities and number of occupations.
6. Late Prehistoric near surface; Late Archaic to ca. 3-4 m depth; possible burial by recent levee deposits.

C. Cut-Off Channel Settings

1. Rapid to moderate alluviation
2. Calcareous sandy to loamy alluvium
3. Excellent geologic stratification
4. Excellent potential to isolate within-stage occupations
5. Feature associations usually clear; faunal preservation excellent to moderate, depending on age of occupations, texture of alluvium, and sedimentation rate.
6. Late Archaic and Late Prehistoric to ca. 7 m depth; individual channels of varying Late Holocene ages.

its position relative to stream channels. Relatively level sites are prone to erosion by sheet wash and/or gulling that can have cumulative effects on a site, especially its upper horizons. This pattern of erosion is most common on terrace sites, which, as described above, have loamy to sandy sediments that are prone to erosion under proper conditions. The second pattern of erosion is lateral in nature, and results from channel migration. Because of the alluvial history of the area, this process is limited to the Holocene streams associated with the present and Holocene floodplain. Virtually any site exposed in cutbanks has been affected by lateral channel erosion. Only when Holocene channels were next to terrace scarps would terrace sites be affected by this process. This has occurred along Isle du Bois Creek, affecting sites such as 41DN346.

Because the local floodplains have been aggrading during the Holocene, no large scale loss of sites on the floodplains has probably occurred. Rather, good preservation conditions have prevailed on local floodplains. Differential loss of sites is attributed more to controls on the positions of meanderbelts and different rates of channel migration during the Holocene. Unfortunately, virtually no data on Early and Middle Holocene channels are available (Ferring 1993), although it has been suggested that Middle Holocene meanderbelts were in approximately the same positions as those of today, especially in the broader reaches of floodplains. Further, channel migration was probably most active in the constricted reaches of the floodplains. Examples of these settings include the areas of sites 41CO150 and 41CO141 (Figure III.2). In these settings, alluvial deposits below the floodplain are dominated by Late Holocene channel facies. Older sites would have been eroded during the Late Holocene, and even Late Holocene sites would have been affected. The important corollary of this problem is the apparently frequent occurrence of Late Holocene sites in cut-off channels in these areas. Thus, active Late Holocene channel migration probably destroyed some sites but created favorable settings for Late Archaic and Late Prehistoric site construction.

In sum, the following appear to be the main patterns of site survivorship at Ray Roberts. Lateral erosion of sites along channels can only be assessed for the Late Holocene, and this has occurred mainly along present meanderbelts and in constricted areas of the floodplains, where this kind of erosion appears to have been most pronounced. The greatest loss or damage appears to have been on Late Archaic sites. Effects on earlier sites cannot be assessed. Lateral erosion has affected terraces mainly along Isle du Bois Creek and its tributaries. Lower terraces suggest minimal sheet erosion from natural causes, although plowing has enhanced this process in the historic period.

The effects of sheet erosion and gullying of terraces is difficult to assess, although this may be a factor contributing to the very low frequency of Paleoindian through Middle Archaic sites in the project area. Erosion down to the clayey B-horizons of terrace soils would be difficult to monitor, since new A-horizons could easily have formed in the last few thousand years. Overall, however, site survivorship in the project area has probably been high for Late Archaic and Late Prehistoric sites.

Site visibility in the project area has been markedly conditioned by the Late Quaternary geologic history of the area, as described in Chapter 6 (and see discussions later in this chapter). Sites on terraces have generally high geologic visibility owing to shallow or surficial positions of artifacts. Late Holocene floodplain aggradation would have caused buried of all older sites as well as many Late Archaic and Late Prehistoric sites. Late Holocene sediments are obscured completely under natural levees and/or veneers of recent alluvium over much of the floodplain. In those settings even deep shovel testing will not expose sediments of Late Archaic age. Late Holocene sites buried deeply in cut-off channels apparently have no surface visibility. The common occurrence of low artifact densities in Late Holocene sites suggests that they will have low visibility even in vertical cutbanks. Any occurrence of rocks, mussel shell concentrations or bones in deeply buried alluvium should be considered likely evidence of archaeological materials.

SITE FORMATION PROCESSES

The study of site formation processes is an area of archaeological research that integrates methods from earth science and archaeology (Butzer, 1982; Schiffer, 1983). These inquiries, within and between sites, focus on differential preservation of artifacts and features and on their differential spatial-stratigraphic physical associations. While cultural factors are necessary considerations (Schiffer, 1987), the present discussions focus on sedimentary and pedologic study of sites in alluvial settings as components of site formation analyses. The objective here is to synthesize the studies at Ray Roberts with respect to formation processes and their implications for the geoarchaeological record here.

Site formation processes in alluvial settings has been discussed in terms of sedimentary environments, rates of sedimentation and geomorphic position of occupation surfaces (Ferring, 1986a, 1992; Ferring and Peter, 1987). Here, the discussions also stress alluvial soils as contexts for archaeological materials. The majority of the sites known from the Ray Roberts area are on terraces (Skinner and Baird, 1985). As prior discussion indicates, terraces in the Trinity Valley are apparently all Pleistocene and have moderately or strongly developed soils at their surfaces where the sites are found. Thus soil forming processes are paramount in understanding site formation processes in these settings. Also, most but not all buried sites are associated with alluvial soils in floodplain sediments. Because of the interplay between alluvial sedimentary environments and soil forming processes on floodplains, an emphasis on soils as part of site formation analysis must include reference to sedimentary environments. These considerations are elaborated on in the following discussions, and are most pertinent to the mitigation efforts are Ray Roberts. It is no coincidence that most of the sites recommended for mitigation by UNT were in floodplain settings. Thus, geology and formation processes were integral aspects of the cultural resources management effort; implicit in this report is the conclusion that geoarchaeological approaches are potentially important aspects of Cultural Resources Management.

Pedogenesis and Site Formation

Specific soil forming processes have direct implications with respect to site formation. These include: organic matter accumulation-decay; addition, translocation or removal of salts; mineral oxidation-reduction; eluviation, illuviation, and shrink-swell of clays; and bioturbation. Geochemical soil forming processes generally result in deterioration of plant, shell and bone remains through leaching, oxidation and biogenic degradation. In contrast, translocation of salts can help preserve shell and bone in calcic horizons. Translocation of carbonates to deeper horizons will promote bone deterioration in the leached horizons. Changing redox conditions are often found in floodplain soils (Hayward and Fenwick, 1983). Iron or manganese mottles or concretions attest to these changes, and signify probable oxidation of pollen and other organic materials. Eluviation of clay can make the eluviated horizon more prone to erosion, and illuviation can increase clay shrink-swell effects in the deeper horizons. Bioturbation, through the action of plants and animals is often greatest in a soil, because of root density and the availability of food in the A horizon for burrowing organisms (Wood and Johnson, 1978; Butzer, 1982, p. 110-114). Also, action of fossorial rodents (Johnson, 1989), crayfish, amphibians or worms (Stein, 1983) can translocate artifacts or selectively move finer sediments to the surface. Bioturbation may, on the other hand, beneficially result in burial of objects that were deposited on a stable surface (Darwin, 1896, p. 308-309).

Site Formation on Floodplains

Study of formation processes on floodplains requires coordinated analysis of sedimentary environments and soils (Holliday, 1990). One of the most important factors in floodplain soil formation is the rate of alluviation. Rates of deposition are in themselves key factors in archaeological site formation processes (Ferring, 1986a). Rates of matrix accumulation define potentials for: a) superpositioning of artifacts associated with serial occupations, b) differential preservation of organic materials, and, c) differential physical disturbance of original associations among artifacts and features. Clearly, rates of sedimentation will correlate at some level, in a given environment, with soil development. Study of these relationships begins with the general observation that a floodplain soil within a section of alluvium denotes a period of relatively slower sedimentation or even surface stability.

Within a particular environment, assessing the impact of floodplain soil-forming and sedimentary processes on archaeological sites involves consideration of several factors: a) the chronology of sedimentation (parent material deposition) relative to non-deposition and floodplain stability, b) the chronology of archaeological occupations relative to sedimentation <u>and</u> soil formation, c) the texture of the soil parent material, d) the length of time the soil formed and e) the burial history of the soil.

The chronology of floodplain sedimentation (parent material deposition) relative to soil formation defines whether the resulting soil will develop as either a cumulative or a non-cumulative soil. Cumulative soils (Birkeland, 1984, p. 184-189) formed as parent material aggraded, while non-cumulative soils formed during periods of non-deposition. A more complex case would involve a cumulative soil forming during a period of levee sedimentation, followed by continued pedogenesis on the stabilized levee sediments after avulsion. Overall, however, site formation processes are different for archaeological materials associated with cumulative or non-cumulative soils.

Synpedogenic burial associated with cumulative soils protects artifacts from erosional disturbance, carnivore gnawing of bone, and active near-surface bioturbation. By contrast, rapid deposition, followed by floodplain stability and development of a non-cumulative soil entails different site formation processes; in this case, the shallowly buried archaeological materials are subject to more intense, adverse modification effects. If stratified archaeological materials are present in a section with an overthickened A horizon, it may be difficult to determine, because of site disturbance, if the artifacts were deposited in single or multiple occupation episodes. Refitting of artifacts (Villa, 1982) or examination of vertical trends in spatial pattering (Ferring and Peter, 1987) are means to assess this problem. For archaeological occupations that post-date deposition of the alluvial parent materials, greater pedoturbation and bioturbation is expected with non-cumulative soils, owing to greater age than cumulative soils with similar thickness.

The timing of archaeological occupation relative to sedimentation and soil development determines the burial depth of the artifacts and features in a site, and their position relative to soil horizons. Again, the differences between cumulative and non-cumulative soils are important. Rapid deposition of parent materials before and after occupation results in better primary context for artifacts. If a non-cumulative soil forms in these sediments, the archaeological materials will be exposed longer to pedogenic effects. By contrast, artifacts and features within an overthickened cumulative soil (at the same depth as in a non-cumulative soil) are subjected to a shorter interval of pedogenesis, but may have been exposed longer to pre-burial agents (erosion, carnivore scavenging). Spatial and temporal variations in sedimentation can result in laterally continuous variations (soil facies) from cumulative to non-cumulative alluvial soils. The relationships described here are ends of this continuum, and specific site histories must be evaluated accordingly. The main point for geoarchaeological investigations is that to understand preserved soils-stratigraphic positioning of archaeological materials, it is necessary to document patterns of pedogenesis and sedimentation.

The texture of alluvial parent material influences the rate of soil formation (Birkeland, 1984, p. 179-181) and thus the rate of pedogenically controlled site modification. In coarser sediments, salts are leached more rapidly and to greater depths than in clayey sediments. In arid regions this will promote faster leaching of carbonates to deeper horizons (Gile et al., 1981; McFadden, 1988), adversely affecting bone preservation for shallow buried archaeological sites. In clayey alluvium, Bt horizons tend to develop more quickly and seasonal clay shrinking can hasten pedoturbation (Birkeland, 1984, p. 180; Brammer, 1971). Because of greater surface area, clayey sediments also tend to have higher amounts of adsorbed organic matter (Birkeland, 1984, p. 246). In north central Texas, calcic horizons are common in Holocene soils formed in clay-silt rich alluvial parent materials, but are leached faster from sandy alluvium. Bone and shell are usually well preserved in the former and absent or poorly preserved in sandy alluvium that was deposited before ca. 1 ka.

Progressive soil formation processes that are factors in site formation continue, with additive effects, unless the soil is buried and soil formation ceases. Field and lab evidence for relative soil ages can be used to assess site formation histories at sites of varying age. Soil age evaluations must take into account textural variations in parent materials and possible climatic differences between periods of soil formation. Some of these considerations are illustrated by investigations at 41CO141 (Ferring 1987).

At 41CO141 (Area 1), late Holocene sediments include several facies, beginning with point bar deposits and grading up to flood basin clays. These are all overlain by recent levee deposits (see Chapter 10). The point bar facies mark the position of the late Holocene channel prior to late Archaic occupations. As the channel migrated away, presumably to the west, a gradual transition to slower overbank floodplain deposition occurred. As rates of deposition slowed, pedogenesis accompanied deposition, and the cumulic West Fork soil began to form in the floodplain facies parent material. Sometime after ca. 950 BP the meander belt was located on the western part of the valley. It subsequently shifted to the east, and the channel began to migrate eastward, toward the archaeological site. Relatively rapid deposition of levee sediments buried the floodplain soil.

The buried West Fork soil, exposed at 41CO141 and many other localities in the upper Trinity Basin, is evidence of floodplain stability in the late Holocene. The West Fork soil is vertic and calcareous because of the smectitic, calcareous clays from Cretaceous limestones, chalks and marls in the valley (Putnam et al. 1979).

At 41CO141, the West Fork soil exhibits an overthickened A-horizon. The A-horizon has strong angular blocky and weak prismatic structure, despite its relatively brief period of formation (less than 2,000 years). This type of structure is characteristic of other West Fork pedons, and is the result of high clay content and frequent clay expansion and shrinking. Similarly, thin clay films are common in the A-horizon and upper C-horizon. The clay films are interpreted as stress argillans, resulting from clay expansion, although micromorphological studies have not been done on these soils.

Formation processes at 41CO141 have included cultural and natural factors (cf. Ferring and Peter, 1987). Multiple occupations of the site were indicated by stratified assemblages of late Archaic artifacts, hearths and faunas. Occupation of the site first took place after the sedimentary environment had gradually shifted from lateral accretion to vertical accretion. Faunal materials and spatial patterning of artifacts was excellent in the lower part of the site, because moderate rates of sedimentation hastened burial, and because calcareous alluvium improved bone preservation. Higher in the profile, bone deterioration and artifact displacement accompanied soil development. As the soil formed, primary carbonates were leached to the lower part of the A and upper part of the C-horizons, maintaining higher soil pH and enhancing bone preservation. Formation of the soil was arrested when the locality was buried by calcareous levee sediments.

Natural formation processes in Locus 1 at 41CO141 were conditioned by parent material composition, sedimentary environments and pedogenesis. The same factors pertain to other floodplain settings, albeit with different local effects and resulting formation histories. At Ray Roberts, the fact that all floodplain sediments are Holocene in age, and most exposed sediments are late Holocene, signifies that modification effects have operated at most for a few millennia. Nonetheless, time-dependent processes, especially cumulative aspects of site modification, are evident.

Other channel fill settings studied at Ray Roberts include sites 41CO144 and 41CO150. Both of these sites have formation histories different from 41CO141/1 owing to the fact that they were in cut-off channel settings (Figure 18.1).

Site Formation on Terraces

With respect to alluvial pedology, the study of archaeological site formation on terraces entails a shift in emphasis from the dynamic factors considered for floodplains to progressive modification processes associated with stable terrace surfaces. Prolonged soil development, erosion and bioturbation alter not only archaeological records, but also the sedimentary and biotic evidence used to reconstruct environments for the archaeological occupations. Eolian or colluvial sediments on terraces are not considered here, although these are clearly important and, in some regions, common contexts for archaeological sites.

For purposes of geoarchaeological study, archaeological sites associated with alluvial terraces can be classified as follows, with examples from Ray Roberts shown in parentheses:

1. Buried terrace site - site that is clearly buried within alluvial terrace fill. These sites were occupied and then buried under the antecedent floodplain prior to terrace genesis. (no known examples at Lake Ray Roberts)

2. Surficial terrace site - site that occurs on or near the terrace surface. The age of occupation relative

to terrace genesis defines two types:

a. <u>Antecedent site</u> - site that was occupied on the active, antecedent floodplain, shortly before terrace genesis. (no known examples at Lake Ray Roberts)

b. <u>Subsequent site</u> - site that was occupied after terrace genesis, on a stable terrace surface. (41DN79; 41DN81; 41DN102-Blocks 1,3; 41DN346)

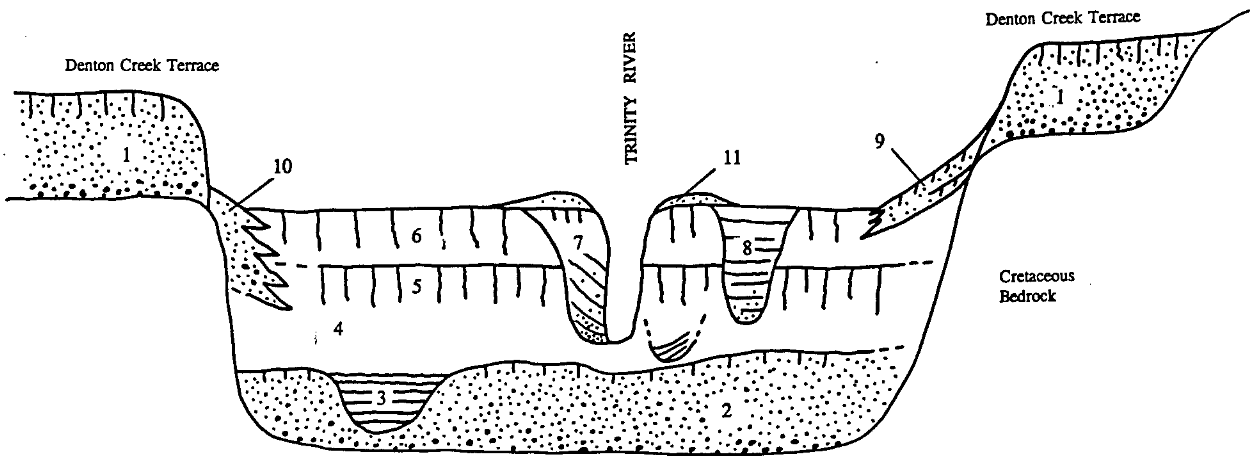


Figure 18.1 Geologic diagram of Late Pleistocene and Holocene sediments in the Ray Roberts area. Note stratigraphic position and site formation settings for archaeological sites.

Buried terrace sites and antecedent surficial sites, because they were initially formed on floodplains, are subject to pedogenically related modification in proportion to their burial depth and to the age of the terrace. Initially in the same position as floodplain sites, these are affected by modification processes following development of the terrace due to changes in groundwater hydrology and from weathering and soil formation at the surface of the terrace. The age of the terrace, holding other soil formation factors constant, defines how long modification agents will affect the site. Burial depth is a principal control on the kind and intensity of pedogenic processes that will affect site modification (eg. Funk and Wellman, 1984). For pedocals, site burial depth defines the position of artifacts and bone with respect to calcic horizon development, which will influence bone preservation. For pedalfers, burial depth will determine whether the archaeological materials occur in the leached, eluviated soil horizons (prone to erosion and bioturbation) or in the clayey B horizons where pedoturbation and oxidation may be more pronounced. Burial depth also defines the positioning of archaeological materials relative to water tables and the potential for oxidizing or reducing (gley) preservation conditions.

Ferring and Peter (1987) analyzed site modification in late Holocene valley fill in Oklahoma. They studied a late Archaic site, with artifacts ca. 50 cm below the terrace surface. Substantial bioturbation and pedoturbation caused vertical displacement of artifacts, and virtually all organic remains had deteriorated in less than 2,500 years. At the Murray Springs Clovis Site in Arizona, weathering and bioturbation resulted in deterioration of virtually all organic materials in the terrace camp areas, yet spatial patterning of lithic artifacts was preserved (Haynes, 1981).

Antecedent and subsequent surficial sites may be difficult to distinguish without independent control over the age of the archaeological assemblages, the age of the terrace, or both. There are several reasons why it is important to make this distinction, and why soils analysis is important in the study of surficial terrace sites. Prehistoric peoples located their floodplain settlements based on prevailing locations of habitats; if these settlements are preserved as antecedent surficial terrace sites, the sediments, soils and depositional geomorphic features surrounding the sites yield information on the original settlement setting. By contrast, when prehistoric peoples located settlements on existing terraces, they may have considered habitats on the terrace and adjacent floodplain. Therefore, for purposes of settlement pattern studies, the difference between antecedent and subsequent terrace sites is significant. Reconstructions of site habitats that use relict depositional geomorphic features such as channel scars or levees are probably valid for antecedent sites only. Analysis of subsequent sites should consider the terrace sediments, geomorphology and soils as important elements of habitat analysis. Waters (1988) documented major shifts in Hohokam settlement locations along the Santa Cruz River, Arizona. Settlement locations on lower bajada surfaces (geomorphically equivalent to terraces in this case) shifted through time in response to environmental changes on the adjacent floodplain, as indicated by a series of buried cienega soils in the floodplain alluvium.

In other regions, and particularly for sites associated with horticultural economies and village settlements, terraces were often selected for habitation because of soil fertility and protection from flooding. Because these sites are generally less than 2,000-3,000 years old, they are almost always situated on terraces. For these sites, soils analysis can focus on modification processes that are associated with the stable surfaces, including those related to human activities.

For sites associated with earlier cultures, however, soils analysis plays a potentially more important role in assessing site formation processes. Alluvial terraces along most drainages in the Southern Plains are Pleistocene; few examples of Holocene terraces have been identified.

In the Upper Trinity River drainage basin, all terraces of the major streams and their tributaries are late Pleistocene or older. Latest Pleistocene and all of the Holocene alluvium is buried below the floodplains. Because of deep burial of prehistoric sites below the floodplains, and because of good visibility of sites on the terraces, the majority of recorded sites, ranging in age from Paleoindian to Historic, occur in terrace settings. Therefore, all of these sites are subsequent surficial terrace sites. Site formation processes on the Trinity terraces are dominated by pedogenic effects, bioturbation and cultural disturbance associated with serial occupations.

Almost all sites above the Trinity floodplain are located on one of the Denton Creek terraces, or less commonly, on the Hickory Creek Terrace (these are "T1" and "T2" respectively, in Table 18.1). Site densities are much higher on the Denton Creek terraces, probably because of proximity to the floodplain and because of better drained, sandy soils. Among all terrace settings, however, the modification factors that dominate the character of preserved archaeological records in sites are soil properties and site age. The upper part of the Coppell Alluvium, the fill for the Hickory Creek Terrace, is usually calcareous clay and silt, although sandy parent materials are located along Isle du Bois Creek at Ray Roberts. The strongly developed soil on this terrace has been forming for much of the Late Pleistocene. Large deep cracks form on the clayey soils in summer due to the presence of shrink-swell clays and considerable mixing of sediment takes place seasonally. Sites that occur on this terrace show evidence of substantial pedoturbation.

Parent materials for the Denton Creek terrace soils are almost all sandy; moderately-developed Paleustalfs have formed on them since middle to late Wisconsin time. A-horizons are leached and usually heavily bioturbated. Substantial movement of sediment in the A-horizon by burrowing rodents, insects and worms probably accounts for the presence of "buried" Archaic artifacts that have been used erroneously to date the alluvium (Crook and Harris, 1957). As for the Hickory Creek Terrace, sites of any age occur on the Denton Creek terraces and disturbance is proportionate to age.

Because of the antiquity of the Trinity River terraces, all sites on them are subsequent surficial sites. Neither geomorphic position nor soil development can be used to predict the age of sites, and progressive site modification is controlled mainly by soil formation processes.

Geocultural Stratification

Review of the processes by which artifacts and features become "stratified" in archaeological sites necessarily entails geologic considerations. However, sites with stratified cultural deposits may encompass a very short time period or a quite long one. And a "multicomponent" site may or may not include any stratigraphic separation between occupations. Discussion of these factors assists in interpretation of the cultural historical chronology at Ray Roberts and also has methodological implications for future research in this region.

Many sites in the Ray Roberts area exhibit evidence of serial occupations. Included are examples of repeated occupations within cultural stages (eg., multiple Late Archaic occupations) and/or occupations within multiple cultural stages (eg., Late Archaic followed by Late Prehistoric). The latter is what most archaeologists working in this region call a "multicomponent site". Because of a paucity of investigations in floodplain settings, and because of higher visibility, most published multicomponent sites have terrace settings; discovery of projectile points, ceramics or other temporally diagnostic artifacts is the usual means of identifying multicomponent sites on terraces. This almost always entails recovery of artifacts from the surface or shallow, mixed deposits.

Thus, the term "multicomponent" has no implied meaning with respect to possible geoarchaeological separation or stratigraphic isolation of different components. Here, the term "geocultural stratification" refers to the contextual association among the archaeological remains of separate occupation events, whether they are within-stage or between-stage. Of principal concern are the kinds of geocultural stratification and their research implications. The vertical relationships of occupation remains and the archaeological potential to attain temporal resolution among occupations are of principal concern. Spatial relations of temporally discrete occupations are also important for finer-scale study of individual sites (Ferring, 1984; Ferring and Peter, 1987).

The term "geocultural" denotes that study of serial occupations of a site usually requires that both geologic and cultural data be integrated into the analysis. The physical-sedimentary associations of artifacts and features may, in some cases, suffice for temporal analysis of occupation histories (eg., two occupation horizons separated by sterile deposits). In other cases, it is primarily the contextual association of "diagnostic" artifacts that comprises evidence of serial occupations (eg., Middle Archaic and Late Prehistoric artifacts on the same surface). Surface sites allow no stratigraphic definition of occupation events. Discretely stratified sites, with intervening sterile deposits, are quite straightforward and easy to deal with.

The intermediate cases, where artifacts and features from multiple occupations are in subsurface contexts, but are not clearly stratified, are commonly encountered. These situations may result from different interactions amongst geologic and cultural processes, and are therefore prone to various archaeological interpretations depending on excavation technique and the analytical approaches taken. Notably, these situations are usually those which require use of arbitrary excavation levels, resulting in recovery of "interval approximations" of superposed cultural materials pertaining to serial occupations.

At the least, consistent and detailed description of different stratification contexts should be completed, followed by derived interpretations of their archaeological meaning. A classification of geocultural stratification contexts for sites at Ray Roberts (Table 18.2) assists in the description and interpretation of site formation histories, including analysis of serial occupation patterns.

Table 18.3 Summary Density Data for Ray Roberts Sites

	artden #/m3	boneden #/m3	fcrden kg/m3	burned %	artifact/ bone
LATE PREHISTORIC					
1021/1-4	292.0	301.0	8.0	32.3	0.97
99/1/2-7	140.3	160.3	7.5	34.0	0.88
81/1/2-4	343.3	120.7	53.1	43.3	2.84
197/22-24	69.3	339.8	22.3	26.9	0.20
141/1/4-7	20.3	307.7	30.2	36.6	0.07
141/2/3-4	40.2	770.9	16.8	32.5	0.05
103/2-5	74.5	119.6	136.9	33.4	0.62
141/2/5-7	62.5	1093.0	27.6	40.5	0.06
avg	130.3	401.6	37.8	34.9	0.71
std dev	113.6	326.7	39.8	4.8	0.88
LATE ARCHAIC					
144/1/3-7	111.8	362.0		48.8	0.31
144/2/2-6	8.2	55.2		37.9	0.15
141/1/8	8.8	77.5	30.0	41.6	0.11
103/6-7	84.8	127.6	184.6	24.1	0.66
99/1/8-15	85.8	117.1	15.0	24.3	0.73
102/1/6-9	87.9	58.9	0.9	39.0	1.49
150/2/A1	4.0	155.3	11.9	45.9	0.03
150/2/A2	45.0	11.5	5.1	0.0	3.91
150/2/A3	162.8	601.7	2.2	34.5	0.27
150/2/B2	69.5	912.3	11.4	30.1	0.08
150/2/B3	2.5	139.7	6.1	25.4	0.02
150/2/B5	2.3	322.2	19.0	50.5	0.01
150/1	6.8	92.1	1.6	27.4	0.07
81/1/5-12	282.8	195.3	109.3	42.0	1.45
avg	68.8	230.6	33.1	33.7	0.66
std dev	76.6	241.7	53.8	12.7	1.02
MIDDLE ARCHAIC					
102/2	174.7	58.1			3.01

Site Formation Summary

The sites considered in this report were mitigated largely because they exhibited good research potential. This potential was appreciated in part because of the formation processes that underlay their geocultural construction and subsequent patterns of preservation. Characteristics of these sites are mainly good stratification of artifacts and features and good faunal preservation (Table 18.3). By focusing on aggradational settings on floodplains and in cut-off channels, a series of well stratified sites were identified and mitigated. With one exception (41DN102 Block 2 with Middle Archaic occupations), all of the mitigated sites were Late Archaic and Late Prehistoric in age. Older sites (notably the Aubrey Clovis Site) are too deeply buried to locate with any frequency without extraordinary deep trenching.

Favorable site formation environments and histories are clearly evident in the mitigation site sample (Table 18.3). Also, major differences between terrace and other settings are clear. The floodplain sites all exhibit good to excellent bone preservation. Indeed, bone densities are higher than lithic artifact densities in all cases except one level at 41CO150 (Block 2, A2), and that case appears to be a strict manifestation of cultural activities rather than poor faunal preservation.
In terrace settings, by contrast, lithic artifact densities are uniformly equal to or higher than bone. When bone occur in those sites, it appears to be only the latest occupations that have preserved bone, such as at 41DN102 Block 1 or 41DN81.

Overall, the densities of lithic artifacts are quite low in floodplain settings. This is consistent with moderate to rapid sedimentation as well as patterns of repeated occupations. In cut-off channels, this pattern is preserved as discretely stratified occupation horizons with discrete features and associations of artifacts and faunas. At 41CO144 and 41CO150 very low artifact densities coupled with good faunal preservation give rare insight as to the nature of probable "brief" occupation events with minimal lithic manufacture yet considerable food resource procurement. There are as many as 50-100 bones <u>per lithic artifact</u> in some horizons of these sites. Only if these stratified occupations were "collapsed" onto a stable surface would the artifact densities have attracted discovery, let alone mitigation in most CRM contexts. Comparison of these sites with mitigation sites at Richland Chambers (McGregor and Bruseth 1987) or Joe Pool Lake (Peter and McGregor 1988) suggest that similar patterns of low density floodplain sites are widespread, but that they have very low visibility and are usually not the subject of mitigation. Those reports also reinforce the patterns of terrace sites formation seen at Ray Roberts with respect to assemblage mixing and poor/selective faunal preservation.

Chapter 19
SYNTHESIS

INTRODUCTION

The following synthesis of prehistoric archaeology at Lake Ray Roberts is an intersite consideration of variation and change in occupation patterns as evidenced by the UNT mitigation investigations. These considerations expand on intrasite discussions presented earlier, which considered patterns of temporal change in multicomponent sites and also described patterning within discrete occupation components. Here, the emphasis is on the evidence for diachronic change in patterns of technology, subsistence, settlement intensity and mobility. As indicated in the research design, patterns of diachronic change will be examined with reference to evidence for adaptation to environmental change, or to regional trends implying external factors in change.

Several factors necessarily condition the intersite analyses. First, the sites investigated contained a limited temporal record, with almost all data pertaining to the Late Holocene period. Only one Middle Archaic archaeological occupation was studied, and no Early Archaic sites are known in this region. The Aubrey Clovis Site was excavated as part of the Lake Ray Roberts Project, but will only be discussed briefly here since it will be treated fully in a separate report. Thus the concentration of examined data in Late Archaic and Late Prehistoric contexts prohibits study of long-term processes of change as well as it prohibits analysis of long-term processes of change as well as it prohibits analysis of long-term adaptation to Holocene Paleoenvironments. In the Southern Mid-continent, this situation is common, because of geologic controls on site preservation and site exposure (Ferring, 1990). Secondly, preservation of discrete occupation horizons was not common at all of the sites investigated. This means not only that a detailed chronology of occupations could not be compiled, but also that mixture of faunas and artifacts may have created false archaeological associations. These problems were examined in Chapter 18. Third, in some cases our excavation areas were small, providing limited samples from low density deposits, which were sought because of their good preservation of occupation debris. These small samples pose problems with quantitative analyses, but are important none the less for qualitative comparisons.

The following discussions begin with a review of the chronology of occupations at the mitigation sites. This culture historical and chronometric framework serves to structure the subsequent discussion of change in technology, subsistence and settlement-mobility patterning. The record of these archaeological patterns is then reviewed with respect to internal and external factors.

Archaeological Chronology

The chronology of the archaeological components was established using natural stratigraphy, radiocarbon dating and artifact crossdating with local and regional typological sequences (Prikryl, 1990; Pruitt 1981; Story, 1990). At the same time, stratigraphic and radiocarbon data allow for some refinement of local typological sequence definition. This was an objective within the chronological analyses. Results of assemblage dating efforts were obviously most successful

Table 19.1 Archaeological Components at Mitigation Sites

SITE/BLOCK	COMPONENTS		
	MA	LA	LP
41DN79/4			+
41DN81		+	+
41DN99		+	+
41DN102/1,3		+	+
41DN102/2	+		+
41DN103		+	+
41CO141/1		+	+
41CO141/2			+
41CO144/1,2		+	
41DN197			+
41DN346		+	+
41CO150/1,2		+	

at sites where rapid deposition and/or brief occupations permitted dating of temporally discrete associations of artifacts. Again obvious is the fact that dating and definition of discrete assemblages was difficult at multicomponent sites in terrace settings or where deposition was slow over the period of repeated occupations (see Chapter 18 and Ferring, 1986, 1992).

The 15 excavation blocks at the ten sites yielded archaeological strata or contiguous arbitrary levels hat have been divided into 19 stage components (Table 19.1). At sites with discrete stratigraphic separation of occupation horizons, within-stage components could be identified for analysis, yielding a total of 27 analytical units. Because mitigation efforts were concentrated on sites with good stratification and faunal preservation, small artifact assemblages were commonly recovered. This is especially true for cores, blank-preforms and tools. But, faunal samples were generally large; with one exception, the number of identifiable bones was much larger than the number of cores, blank-preforms and tools. Thus subsistence data are summarized in greater detail than artifact data in this chapter.

In terms of stage components, six blocks yielded stratified Late Archaic and Late Prehistoric materials. Discrete Late Archaic components were defined at 41CO144 and 41CO150, and discrete Late Prehistoric components were defined at four blocks (Table 19.1). The only Middle Archaic components is at 41DN102 (Block 2). At the six sites with stratified Late Archaic-Late Prehistoric components, mixture of some artifacts and faunas is evident near the defined boundary of arbitrary levels.

Radiocarbon ages show that the majority of the occupations studied date between ca. 3,000 and 500 yr bp (Figure 19.1). Reliable ages greater than 2,000 yr bp were only obtained on samples from 41CO144 and 41CO150. These are the two sites that occur in cut-off channel settings. Most Late Archaic occupations were from stable or slowly aggrading settings that did not preserve datable material. The young age of ca. 500 yr bp from 41CO144, and the from 41DN103, reported by Skinner and Baird (1985) are considered unreliable. The age of ca. 2,000 yr bp from 41DN102, also reported by Skinner and Baird (1985), may be reliable, but it was from a sample from a test unit. Indeed, it was that radiocarbon age and its context that led to the successful exploration for older occupation horizons off the edge of the terrace at that site. In this way, the only in situ Middle Archaic occupation in this region was found.

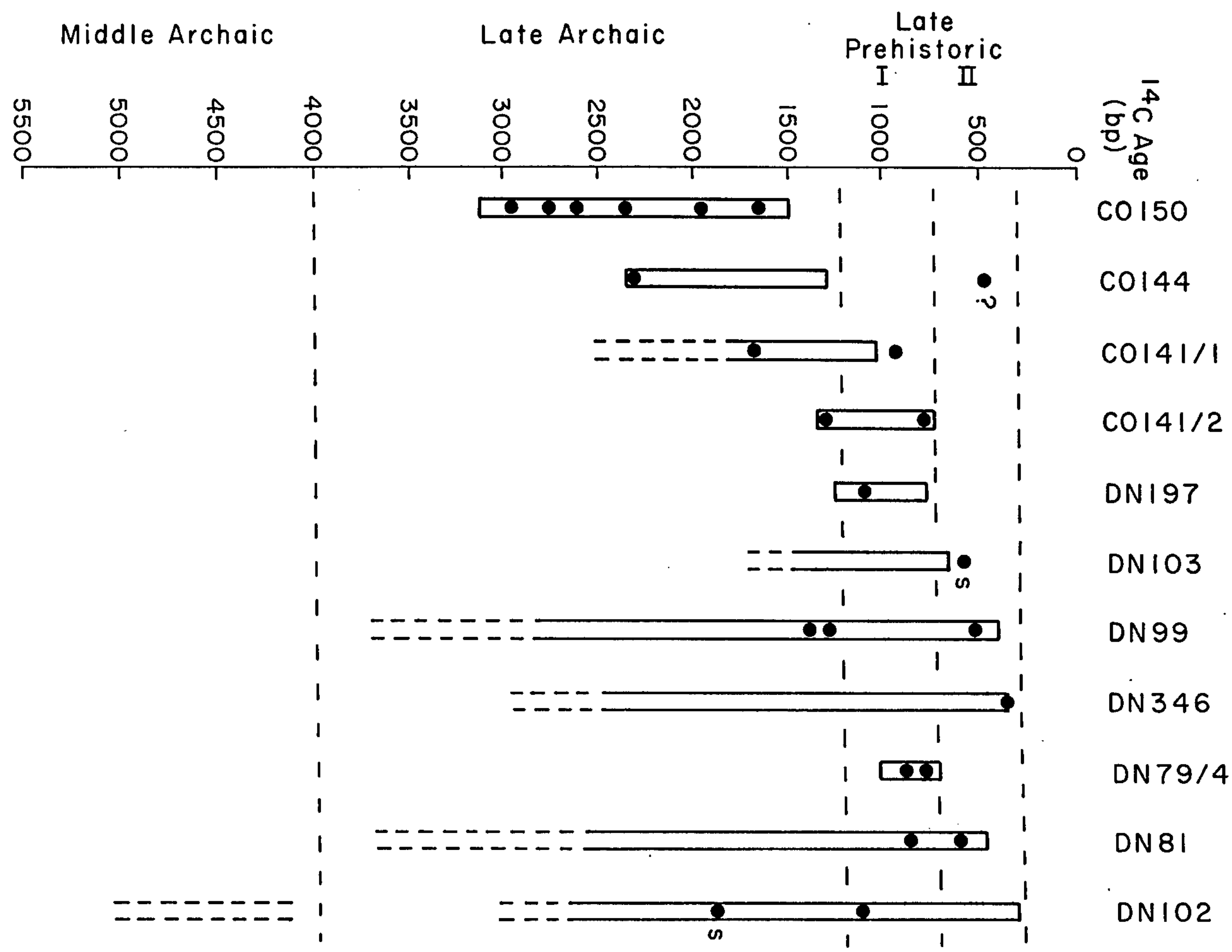


Figure 19.1 Radiocarbon ages from mitigation sites

Assemblages of tools, compared to other dated assemblages (Prikryl, 1990; Story, 1990) show clearly that there are substantial Late Archaic occupations at 41DN81, 41DN102, 41DN346 and 41DN99, but no radiocarbon ages for these are available. The ages from 41DN99 are ambiguous, as described earlier. They arereliable ages, concordant with typological data for early Late Prehistoric (cf. Late Prehistoric I) from 41DN197, 41DN79 and 41CO141/2. Undated assemblages of this stage were recovered from 41DN102, 41DN81, 41DN346, 41DN99 and 41DN103. Ceramics, projectile points and three radiocarbon ages document Late Prehistoric II occupations at 41DN102, 41DN346 and 41DN99.

Technological Variability

Assemblage summaries are used here to show gross compositional variation among the occupation units (Table 19.2). Small sample sizes prohibit detailed analyses, yet some overall patterns are quite evident. Most notable is the lack of major differences for the grouped Late Prehistoric and Late Archaic assemblages. Core and blank-preform frequencies are very similar. The low frequency of cores is, for both groups of assemblages, marked by samples with no cores and samples with 2-18% cores. The highest core frequencies are at sites where burial was fairly rapid (41DN79-4 and 41DN99). Cores are quite common throughout the sequence at 41DN81; perhaps the midden-like character of the deposits there also register burial patterns. The issue of burial is important since burial would remove the possibility of core re-use, thereby enhancing core preservation. Alternatives to explaining core frequencies include on-site activities, occupation intensity and tool blank curation-transport. If on-site activities were dominated by hunting, then core frequencies should be lower than biface and blank-preforms. This is uniformly the case for both Late Prehistoric and Late Archaic samples. Use of cores to make flake blanks for arrow points might be expected for Late Prehistoric occupations (Bradley, 1974; Ferring and Peter, 1982). Although many of the blank-preforms from Late Prehistoric samples are on flake blanks, the core frequencies suggest that many of those blanks were imported to the sites.

Slightly higher frequencies of biface fragments among Late Prehistoric samples, compared to Late Archaic ones, is probably a function of bifacial technology. Pressure flaking of preforms would result in failures having "final" retouch morphology. Errors at similar stages of dart point manufacture would yield biface fragments that would be classified as blank-preforms.

Patterns of raw material procurement, transport and curation are an integral part of the lithic technological system. For the Late Ray Roberts sites, raw material has been dichotomized into chert and quartzite categories. Although quartzite includes petrified wood and both ortho- and meta-quartzites (Banks, 1990), although all samples are completely dominated by locally available Ogallala quartzite. This is a derived metaquartzite that must be procured from upland surfaces and high strath terraces (Menger and Slaughter, 1968). As mentioned previously, cherts here are almost all "regional chert" in that no source has been identified; yet, well-known types such as Edwards chert, from outside north-central Texas, are extremely rare in these assemblages. The only logical source for the regional cherts is to the western part of north-central Texas where Pennsylvanian and some Cretaceous rocks bear chert.

Chert frequencies among all assemblages vary between 8-32%, with the exception of one stratum at 41CO150A, which had a single cluster of ca. 800 chert flakes and chips and a resulting assemblage chert frequency of 79% (Table 19.3). If this sample is removed, the mean-chert frequency for Late Archaic debitage samples is 19%; thus the mean frequency of chert for Late Prehistoric, Late Archaic and Middle Archaic is between 18% and 19%. 41DN346 has the lowest frequency of chert for both Late Archaic and Late Prehistoric samples, except for very low chert occurrence in the deeper levels of 41CO144. Except for the small sample at 41CO141/1/8, the Late Archaic samples with high chert frequency correlate with a high small-large flake ratio, suggesting that tool maintenance accounts for the chert frequency (Table 19.3). Small-large flake ratios for Late Prehistoric chert are much more equal, suggesting a different pattern of chert use.

Very distinctive patterns of raw material use are indicated for the three occupation stages (Table 19.4). The Middle Archaic (MA) assemblage from 41DN102 exhibits high use of chert for all core and tool classes. The use of chert for cores is especially significant, since large flake cores account for 20% of the assemblage. Use of chert for blank-preforms, at 30%, is also much higher than for any other site (except 41DN197, which has only one blank-preform). These data support the interpretation that the MA occupants imported and curated both cores and blank-preforms at the site. At the same time, they used local raw materials for about half of the unifacial and bifacial tools.

Cores are rare in Late Archaic (LA) assemblages, but at 41DN81 and 41DN99, many of the cores are chert. These are the only two assemblages that have any chert blank-preforms. Typological data presented earlier suggest that these two sites have LA occupations that begin earlier than at the other LA sites, perhaps towards the transition from the Middle to Late Holocene. Overall, chert use is quite high for unifacial and bifacial

Table 19.2 ASSEMBLAGE SUMMARIES

	CORES	BLANK PRE-	BIFACE FRAG	UNIFAC	ARROW PT	DART PT	N
LATE PRE							
1021/1-4	0.03	0.20	0.12	0.09	0.29	0.26	99
99/1/2-7	0.04	0.22	0.13	0.03	0.30	0.28	97
81/1/2-4	0.12	0.24	0.18	0.24	0.10	0.13	68
79/4	0.18	0.18	0.09	0.36	0.18	0.00	11
197/22-24	0.00	0.14	0.29	0.00	0.57	0.00	7
346/1-6	0.04	0.19	0.10	0.03	0.27	0.37	113
141/1/4-7	0.00	0.10	0.10	0.20	0.60	0.00	10
141/2/3-4	0.00	0.25	0.00	0.33	0.42	0.00	12
103/2-5	0.04	0.32	0.08	0.04	0.36	0.16	25
141/2/5-7	0.06	0.13	0.06	0.06	0.50	0.19	32
AVG	0.05	0.20	0.11	0.14	0.36	0.14	
LATE ARCH							
144/1/3-7	0.00	0.17	0.00	0.17	0.00	0.67	12
144/2/2-6	0.00	0.00	0.00	0.75	0.00	0.25	4
141/1/8	0.00	0.00	0.00	0.33	0.00	0.67	3
103/6-7	0.00	0.33	0.00	0.00	0.00	0.67	9
99/1/8-15	0.14	0.24	0.04	0.10	0.00	0.48	50
102/1/6-9	0.00	0.17	0.00	0.17	0.00	0.67	6
346/7-12	0.02	0.39	0.04	0.07	0.04	0.43	46
150/2/A	0.08	0.04	0.08	0.25	0.00	0.54	24
150/2/B	0.00	0.26	0.11	0.17	0.00	0.46	35
150/1	0.00	0.12	0.06	0.35	0.00	0.47	17
144/1/9-13	0.00	0.75	0.00	0.25	0.00	0.00	4
81/1/5-12	0.11	0.17	0.17	0.39	0.01	0.16	83
AVG	0.03	0.22	0.04	0.25	0.00	0.45	
MID ARCH							
102/2	0.20	0.19	0.00	0.33	0.00	0.28	54

Table 19.3 DEBITAGE SIZE AND CHERT FREQUENCY

	LG QTZ	SM QTZ	LG CHT	SM CHT	PCT CHERT	N
LATE PRE						
1021/1-4	0.48	0.38	0.08	0.06	0.14	2123
99/1/2-7	0.47	0.34	0.12	0.07	0.19	3396
81/1/2-4	0.18	0.61	0.03	0.18	0.21	1583
79/4						0
197/22-24	0.51	0.29	0.10	0.10	0.20	102
346/1-6	0.32	0.56	0.03	0.09	0.12	911
141/1/4-7	0.58	0.22	0.13	0.07	0.20	55
141/2/3-4	0.62	0.22	0.10	0.06	0.16	69
103/2-5	0.50	0.32	0.11	0.06	0.18	871
141/2/5-7	0.59	0.22	0.13	0.07	0.20	116
Mean	0.42	0.32	0.08	0.08	0.18	
LATE ARCH						
144/1/3-7	0.52	0.31	0.09	0.08	0.17	491
144/2/2-6	0.28	0.44	0.00	0.28	0.28	43
141/1/8	0.75	0.00	0.25	0.00	0.25	4
103/6-7	0.55	0.33	0.09	0.04	0.13	411
99/1/8-15	0.56	0.29	0.09	0.06	0.15	1762
102/1/6-9	0.48	0.34	0.11	0.08	0.18	317
346/7-12	0.28	0.64	0.01	0.07	0.08	258
150/2/A	0.03	0.18	0.05	0.74	0.79	1191
150/2/B	0.17	0.62	0.05	0.16	0.21	1483
150/1	0.19	0.49	0.04	0.28	0.32	273
144/1/9-13	0.54	0.42	0.04	0.00	0.04	91
81/1/5-12	0.17	0.54	0.06	0.23	0.29	2831
Mean	0.38	0.38	0.07	0.17	0.24	
MID ARCH						
102/2	0.35	0.46	0.11	0.08	0.19	1569

Table 19.4 CHERT USE

	CORES	BL-PREF	BIF FRAG	UNIFAC	A POINTS	D POINTS
LATE PREHISTORIC						
1021/1-4	33.3	17.6	41.6	55.5	34.5	46.1
99/1/2-7	0	4.7	38.4	0	58.6	29.6
81/1/2-4	50	12.5	50	56.3	85.7	100
79/4	0	0	0	75	50	
197/22-24		100	50		50	
346/1-6	0	0	45.5	66.7	40	30.9
141/1/4-7		0	0	0	66.7	
141/2/3-4		0		100	20	
103/2-5	0	12.5	0	100	11.1	25
141/2/5-7	0	50	0	0	31.3	16.7
LATE ARCHAIC						
144/1/3-7		0		0		25
144/2/2-6				66.7		100
141/1/8				0		50
103/6-7		0				50
99/1/8-15	42.9	8.3	50	60		37.5
346/7-12	0	0	0	100	50	40
102/1/6-9		0		100		50
150/2/A	0	0	100	100		76.9
150/2/B		0	75	66.7	25	16
150/1		0	0	66.7	62.5	8
144/1/9-13		0		0		
81/1/5-12	77.7	21.4	64.3	75	100	61.5
MIDDLE ARCHAIC						
102/2	45.4	30		55.5		53.3

Table 19.5 Projectile Point Raw Materials

	% CHERT	N
ARROW POINTS		
Fresno	56	9
Scallorn	49	39
Alba-Catahoula	39	28
Washita	50	8
Bonham	38	16
Colbert	0	3
Toyah	100	2
Perdiz	60	5
Maud	100	1
Indeterminate	42	50
DART POINTS		
Gary	29	65
Ellis	78	9
Ensor/Marcos	83	6
Godley	31	13
Darl	100	1
Trinity	80	5
Yarborough	33	9
Dallas	0	1
Marshall	75	4
Edgewood	40	5
Elam	20	5
Carrollton	33	6
Langtry	0	1
Side notched	100	2
Wells	0	2
Palmillas	0	1
Calf Creek Tang	100	4
Morrill	100	1
Kent	50	2
Frio	0	1

tools in the LA assemblages (Table 19.4). For almost all samples, chert use for tools is much higher than would be expected from the chert debitage data (Table 19.3). The general absence of chert cores and blank-preforms, coupled with the generally high small-large chert debitage ratios, strongly suggest that most LA folk transported and curated chert tools, as opposed to cores or blank-preforms.

Chert use by LP peoples included somewhat higher on-site reduction of bifaces for certain assemblages (Table 19.4). Unifacial tools are either all quartzite or have quite high chert frequencies. All assemblages have moderate to high chert use for projectile points, except three from 41CO141 and 41DN103. Higher proportions of chert blank-preforms, as well as lower small-large chert debitage ratios suggest that, in contrast to LA patterns, LP people transported and curated flake blanks rather than finished tools.

Prikryl (1990) identified changing patterns of chert-quartzite use for prehistoric sites in the Upper Trinity River Basin. Although data from Lake Ray Roberts are restricted, they generally support his conclusions, except that chert use from in situ assemblages is quite high for all periods, and debitage data suggest that chert use is specific in a technological-curation sense beyond projectile point manufacture-transport. Frequencies of chert among projectile point types explain some of the variability in the Lake Ray Roberts assemblages (Table 19.5). Arrow point types have moderate to high frequencies of chert. Dart point types exhibit much more variation in chert use. Contracting and straight stemmed forms, especially Gary, Godley, Yarborough, Elam and Carrollton types, have low chert frequencies. In contrast, expanding stemmed or corner-notched forms, such as Ellis, Ensor/Marcos, Trinity and Marshall have high chert frequencies. Compared to the larger yet undated sample of Prikryl (1990) the Ray Roberts Mitigation data indicate higher chert frequencies for most dart point types, and lower frequencies, of chert for arrow point types (Table 19.5). The explanation for this probably is related to the fact that Prikryl's data included samples from sites farther south, and closer to the West Fork Trinity drainage. This possibility is accentuated by data from sites along Mountain Creek (Peter and McGregor, 1988) where almost all projectile point types are predominately chert (Table 19.5). Data from Richland Chambers Creek Reservoir are more similar to those from sites along the Elm Fork Trinity. Overall, these data suggest that raw material availability, rather than regional patterns of raw material use. None the less, changes in raw material procurement and curation at Ray Roberts have adaptive significance.

Stylistic Variation

In addition to radiocarbon ages and stratigraphic relations, typological-stylistic data were used to define and isolate occupation units between and within stage units. Previous studies, especially Prikryl (1990), Story (1990) and Pruitt (1988) were used to define temporal divisions among stratified assemblages. Essentially, however, most chronological schemes utilize variation in projectile point class (dart points versus arrow points) as a first order chronometric index. Projectile point style/type are used as second order indices, for defining both interstage and intrastage units. This approach was employed to define the Middle Archaic (MA) age of horizons at 41DN102, Block 2, and to a lessor degree allows distinctions between Late Prehistoric I and Late Prehistoric II units at stratified sites. However, ceramic data and certain unifacial tool classes, such as Clear Fork gouges, are also important in this regard.

Typological data from Lake Ray Roberts sites conform quite well to proposed sequences cited above. This is certainly true for definition of MA, LA and LP assemblages. The potential for these sites to further refine such artifact sequences is basically conditioned by the geologic stratification and occupation patterns at specific sites. Those sites which formed in rapid depositional settings have yielded important artifact associations, albeit with the low artifact densities that accompany such settings. The assemblage from 41DN102, Block 2 is perhaps most notable, since Middle Archaic sites have not yet been identified in this region. The association of Wells, Calf Creek, Palmillas, Morrill and Kent dart point types, as well as Clear Fork gouges conforms well to associations proposed by Story (1990). LA assemblages vary considerably. The older ones, such as at 41DN99 and 41DN81 include more straight stemmed dart point forms, as well as one hematite boatstone at 41DN99.

Late Archaic assemblages from 41CO150 and 41CO144 are important because of their deep burial and stratigraphic integrity. These sites, especially 41CO150, show that contracting stemmed point forms, persist for much of LA time, yet are interstratified with assemblages that are dominated by corner-notched to expanding stemmed forms such as Ellis, and Ensor/Marcos, Unifacial tools are quite simple scrapers or retouched pieces and appear to lack chronological trends in form or frequency.

The transition from the LA to the LP period is registered at several sites, although the most clear data come from sites with low artifact density. Mixture of artifacts is clear at sites which formed in settings with very slow rates of sedimentation, such as 41DN346, and 41DN81. A number of the components assigned to the LP period have dart points associated with arrow points. These assemblages are of two apparent lands. Those with "mixed" associations of LA and LP artifacts include 41DN102, 41DN99, 41DN346 and 41DN81 (Table 19.2). The dart points from LP horizons at 41DN41 and 41DN103, however, appear to be valid associations. Those dart points are all contracting stemmed ("Gary") forms. But, they are either very small and thin, or are serrated. These dart points are associated with arrow point forms such as Scallorn and Alba, frequently with serrated edges, as previously assigned to the LPI by Prikryl (1990). Scallorn and Alba points were found associated in a single human burial by Lynott (1976) at Lake Lavon. Interestingly, none of the clear early Late Prehistoric assemblages contain ceramics. Grog, grit or bone tempered plain ceramics at 41DN99 may relate to this period however.

Late Prehistoric II assemblages are present at 41DN102, 41DN99, 41DN81, 41CO141 and 41DN103. These are indicated by arrow point types such as Washita, Fresno and Toyah, and by plain, shell-tempered ceramics ("Nocona Plain"). Radiocarbon ages from Lake Ray Roberts sites suggest that the LA-LP transition took place ca. 1,000 ±150 yr bp. The LPII occupations appear to date between that interval and ca. 500 yr bp.

Subsistence Patterns

One of the main criteria used to select sites for mitigation at Lake Ray Roberts was the evidence for faunal preservation. Thus, vertebrate faunal remains were recovered from each of the sites. Previous discussions on each site indicate, however, that preservation was not even among the sites, and therefore differential preservation has to be taken into account for comparative purposes. This is especially true for comparison of sites in terrace versus flood plain or cut-off channel settings (see Table 18.2). Additionally, small excavation blocks sometimes yielded small faunal samples despite good preservation.

The detailed presentation of faunal data for each site have been reduced considerably for the present purpose of summary and comparison (Table 19.6). Faunas have been grouped into major taxonomic, habitat, or size categories, with the number of individual specimens (NISP) and number of taxa for each category. Principal game species (rabbit, deer and bison) are reported separately, while the other categories include multiple genera and species.

When all faunas are compared on the basis of their NISP/TAXA ratios, a linear relationship is evident (Figure 19.2). This pattern is concordant with general faunal data from both archaeological and non-archaeological contexts (Grayson, 1985). This linear trend is offset by three LA samples that have a higher NISP/TAXA ratio. These faunas are from 41CO150/2/A2, 41CO150/2/B5 and 41DN81/1/5-12 (Table 19.7). This divergence is, in each case, the result of a high number of aquatic turtle fragments from a limited number of taxa. The same effect is noted for the LP fauna from 41DN141/2/5-7. The implication of the NISP/TAXA ratio is that small samples yield unreliable information about the faunal variation. This is simply a sampling and/or preservation problem. Small samples from the study sites were, in some cases, the result of small excavation blocks (eg. 41DN79, 41DN197) or small areas of preserved sediment within the block area (eg. 41CO150/2/A2). In other cases, poor faunal preservation was the problem (eg. 41DN346, 41DN99/6-12). Overall, however, excellent faunal recovery from discrete contexts was achieved.

The frequencies of principal game species indicate quite high variability within both LA and LP samples (Table 19.7). The highest frequencies of deer are registered in LP samples, especially from DN197, DN346 and DN141/1. Comparably high deer frequencies in LA samples are only seen in 41DN99/6-12 and 41DN346/7-12. At 41DN346 faunal preservation is poor. Overall, however, deer frequencies in LP samples are about 10% higher than for LA samples. Notably, deer accounts for only 15.6% of the Middle Archaic fauna from 41DN102. Only 41CO150/2/B5 has a comparably low deer occurrence among both LA and LP samples. Small game is almost always less common than deer. Exceptions include both LA and LP samples from 41DN102, and one level from the LA occupations at 41DN141. Small game accounts for over 70% of the fauna from the MA sample from 41DN102. This is unique among all the faunal samples, and is accompanied by very low numbers of turtle and fish. The low proportions of deer and aquatic resources, coupled with the absence of bison, suggest that the Middle Archaic subsistence strategy was focused on diverse resources,

Table 19.6 FAUNAL SUMMARIES

	FISH	BOX TURTLE	AQUAT TURTLE	RABBIT	SMALL GAME	DEER	BISON	BIRDS	NISP	TAXA	NISP/TX
LATE PRE											
1021/1-4	12-4*	29	4-3	116	19-5	92	+	4-3	275	16	17.19
99/1/2-5	3-2	65	7-4	22	9-5	183			288	14	20.57
81/1/2-4	8-2	40	21-2	29	30-3	85		3	216	11	19.64
79/4	2	18	2-2	1	7-5	10			40	11	3.64
197/22-24				8	2	29		2	33	4	8.25
346/1-6			1			12			13	2	6.50
141/1/4-7	4-3	10	3	31	6-4	138		6-3	198	14	14.14
141/2/3-4	2-2	41	9	61	19-4	225		7-4	364	14	26.00
103/2-5	1	21	7-4	1	10	22		2-1	68	14	4.86
141/2/5-7	21-4	105	159-4	223	46-6	328		19-5	902	23	39.22
LATE ARCH											
144/1/3-7	5-2	44	1	38	29-6	137		6-4	260	17	15.29
144/2/2-6	16-2		1	5	2-2	34	+	4-2	62	10	6.20
141/1/8	1	5	4	43	6-4	31			90	8	11.25
103/6-7		9	4-2	2	18-3	30		1	64	9	7.11
99/6-12	3-3	32	5-3	49	32-5	314	+	3-2	438	17	25.76
102/1/6-9	4-2	2		38	6-2	17			67	5	13.40
346/7-12		13	3-1	3	11-3	63			93	7	13.29
150/2/A1		22	1	5	1	24			53	5	10.60
150/2/A2	1	81	132-3	135	26-3	223			606	11	55.09
150/2/A3	1	73	44-4	29	7-2	87		11-2	252	13	19.38
150/2/B2	45-4	50	97-3	484	39-8	518		78-7	1311	25	52.44
150/2/B3	12-2	11	95-2	92	11-7	80		1	302	16	18.88
150/2/B5	31-3	196	190-3	6	5-3	61		7-3	496	15	33.07
150/1	2-2	21	4-2	18	17-6	108	+	2-1	172	15	11.47
144/1/9-13	1	2	2-1	37	27-3	73		4-2	146	10	14.60
81/1/5-12	14-4	46	118-5	32	114-3	219			543	15	36.20
MID ARCH											
102/2	9-4	10	4-3	116	29-5	32		5-3	205	18	11.39

* (NISP-TAXA)

Table 19.7 Faunal Frequencies

	Small Game	Box Turtle	Fish & Aquatic Turtle	Deer	NISP
LP					
102/1/1-4	49.1	10.5	5.8	33.5	275
99/1/2-5	10.8	22.6	3.5	63.5	288
81/1/2-4	27.3	18.5	13.4	39.4	216
79/4	20.0	45.0	10.0	25.0	40
197/22-24	30.3	0	0	87.9	33
346/1-6	0	0	7.7	92.3	13
141/1/4-7	18.7	5.1	3.5	69.7	198
141/2/3-4	22.0	11.3	3.0	61.8	364
103/2-5	16.2	30.9	11.8	32.4	68
141/2/5-7	29.8	11.6	20.0	36.4	902
				$\bar{x} = 54.19$	
LA					
144/1/3-7	25.8	16.9	2.3	52.7	260
144/2/2-6	11.3	0	27.4	54.8	62
141/1/8	54.4	5.6	5.6	34.4	90
103/6-7	31.3	14.1	6.3	46.9	64
99/6-12	18.5	7.3	1.8	71.7	438
102/1/6-9	65.7	3.0	6.0	25.4	67
346/7-12	15.1	14.0	3.2	67.7	93
150/2/A1	11.3	41.5	1.9	45.3	53
150/2/A2	26.6	13.4	21.9	36.8	606
150/2/A3	14.3	30.0	17.9	34.5	252
150/2/B2	39.9	3.8	10.8	39.5	1311
150/2/B3	34.1	3.6	35.4	26.5	302
150/2/B5	2.2	39.5	44.6	12.3	496
150/1	20.4	12.2	3.5	62.8	172
144/1/9-13	43.8	1.4	2.1	50.0	146
81/1/5-12	26.9	8.5	24.3	40.3	543
				$\bar{x} = 43.85$	
MA					
102/2	70.7	4.9	6.3	15.6	205

coupled with the absence of bison, suggest that the Middle Archaic subsistence strategy was focused on diverse resources, especially small game, in a drier environment that probably lacked extensive wooded and edge habitats for deer populations.

Late Archaic and Late Prehistoric faunas show variable exploitation of riparian, wood (and prairie habitats, but almost always with deer as a principal game species. Data from 41CO150, Block 2, provide the best example of repeated occupations during the Late Archaic. There, diverse small game, turtles, fish, mussels and deer were processed as part of a general foraging strategy that appears to have been incorporated into a pattern of residential mobility. This subsistence strategy appears to have continued into the Late Prehistoric period,following the transition to bow-arrow weaponry. Late Prehistoric assemblages, on

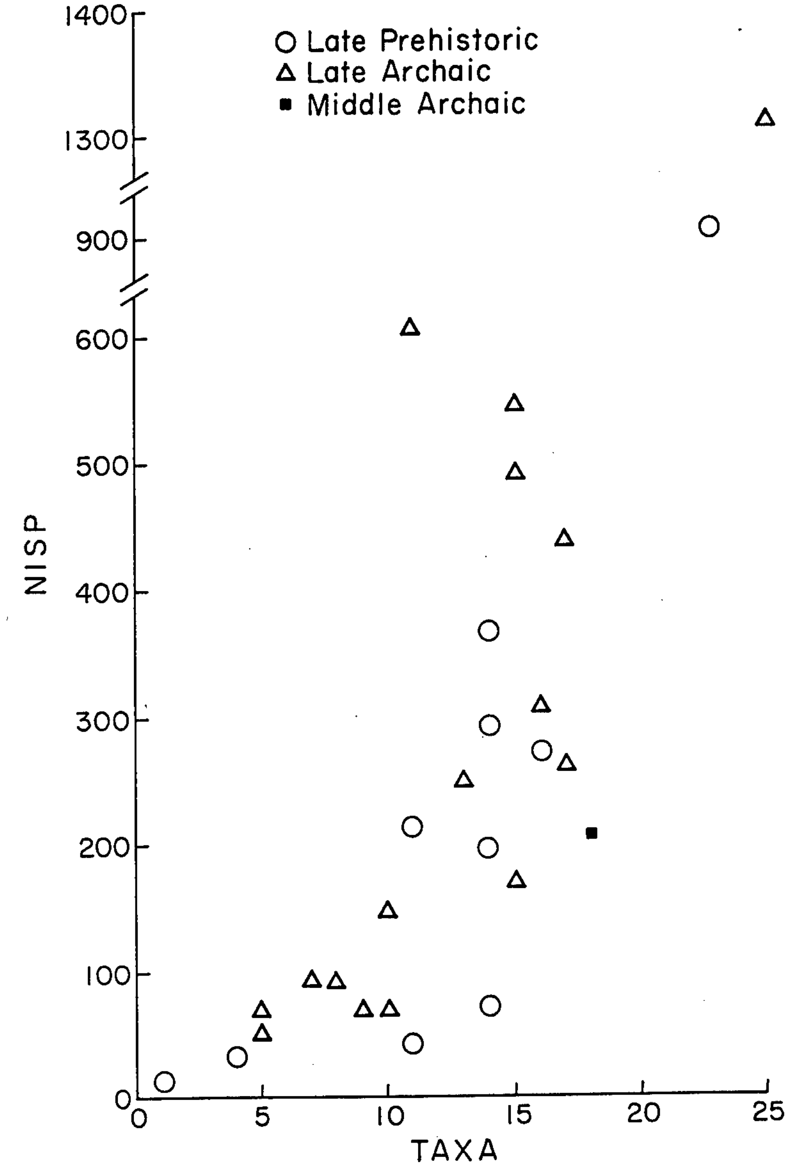


Figure 19.2 NISP/TAXA relationships for faunas from mitigation sites.

average, have fewer unifacial tools than Late Archaic ones, suggesting some decrease in processing activity diversity. The samples with the highest proportions of unifacial tools are quite small (Table 19.2). There is a modest correlation between the frequency of unifacial tools and small game faunal frequency (Figure 19.3). Considerable over lap of LA and LP samples is evident, but a trend towards less diverse procurement strategies between the LA and LP occupations is suggested. An exception to this is the LPII occupation at 41DN102, which has a high proportion of small game but a low proportion of unifacial tools. Those occupations also included bison procurement (Table 19.7), which appears in more LA samples than LP ones. Bison remains are rare in the faunas from these sites, but the presence of bison is documented for the later part of the Late Archaic period, and for the latter part of the LP period. Bison are notably absent from the MA fauna at 41DN102. This pattern correlates quite well with the model of Dillehay (1974) and contrasts with that of Lynott (1981). Ferring (1995) argued that bison presence in north-central Texas, and the eastern part of the southern plains, should correlate positively with increased moisture, rather than with drought as proposed by Lynott (1981) and Hall (1988).

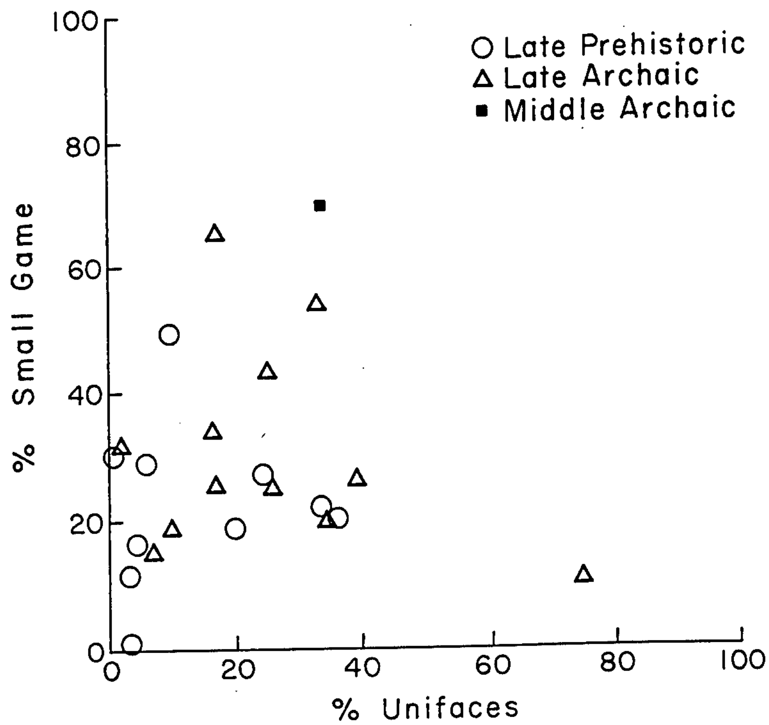


Figure 19.3 Scattergram of small game and unifacial tool frequencies

McDowell (1981) provides excellent data showing that bison populations were higher in the early and late Holocene periods. Low bison populations during the drier middle Holocene are well documented (Meltzer, 1991). Late Holocene climate change was characterized by shorter-term, lower magnitude shifts in precipitation, and thus the record of environmental change is less pronounced than that of the middle Holocene. Unfortunately, an archaeological record showing adaptive shifts from the middle to late Holocene (MA to LA) cannot be constructed with available data. None the less, the data from Lake Ray Roberts show significant differences in environment and adaptations between the single MA occupation at 41DN102 and the later (ca. 3,000-1,500 yr bp) LA occupations at other sites. Isotopic data (Humphrey and Ferring, 1994) indicate that the middle to late Holocene climatic shift was probably accompanied by expansion of upland forests (the Cross Timbers), in areas with sandy soils, while prairie habitats probably became capable of supporting greater animal populations. Reduction in forest cover, of lessor, magnitude, probably took place during the later part of the Late Archaic period, but forest and edge habitats appear to have supported large or moderate deer populations none the less. According to the environmental reconstruction offered by Humphrey and Ferring (1994) and here, modest increases in bison populations should be expected in the Late Archaic and Late Prehistoric II periods, during times of increased precipitation. Between these times, however, a shift to hamlet occupations is registered regionally (Peter and McGregor, 1988; only example of a LP hamlet at Lake Ray Roberts. It may be comparable to that at the Cobb-Pool Site at Mountain Creek (Peter and McGregor, 1988), but is probably somewhat younger.

Summary and Conclusions.

Prehistoric sites mitigated at Lake Ray Roberts have yielded important data concerning adaptations and change from the Middle Archaic to the Late Prehistoric periods. Clovis occupations at the Aubrey Site, dated to ca. 11,550 yr bp, provide an excellent record of adaptations to terminal Pleistocene environments. These will be reported separately (but see Ferring (1989, 1990)). No Early Archaic sites are known in this area, although point styles from surface collections indicate the presence of Early Archaic populations (Prikryl, 1990).

Middle Archaic occupation of the project area is uniquely registered at 41DN102. Hearths, a burial, an unmixed assemblage of artifacts and fauna provide new evidence of adaptations to a drier Middle Holocene landscape. Artifact types are similar to those from adjacent regions (Story, 1990) suggesting broad cultural interactions. The foraging economy emphasized procurement of small game and deer. It is assumed that these people were quite mobile, as repeated occupations of the site during the MA period are evident.

The most substantial occupations of the project area took place in the later part (post-3,000 yr bp) of the LA period. This is clearly a broad regional trend (Ferring, 1990, 1995) although poor site exposure limits our understanding of earlier periods. Late Archaic sites here uniformly register mobile foragers that exploited all habitats available to them. Residential mobility (Binford, 1982) is implied. Repeated occupations at multiple sites were characterized by use of rock-lined and unlined hearths. On stable surfaces these are recorded as rock middens. In aggrading environments, discrete hearth construction events are clear. Import and curation of chert tools is evident, and contrasts with core-biface curation in the MA period. Chert was preferentially used for straight, expanding and corner-notched points, while local raw materials were reduced on-site and dominate the contracting -stemmed forms. Despite quite good resource availability, dietary stress is recorded from skeletal and dental analyses (Gill-King, this Volume).

There are no woodland-like sites in north-central Texas, suggesting that Plains Woodland influence/contact did not characterize the transition to the Late Prehistoric period. No ceramics were found with LPI assemblages, which have Scallorn, Alba and small Gary points. These appear to be short-term occupations that took place under conditions of reduced precipitation compared to the Late Archaic. Except for the replacement of darts with bow-arrow weaponry, these occupations are essentially similar to the Late Archaic. Regional exchange of technological information, rather than environmental change, probably is the factor behind the LA to LP shift.

Late Prehistoric II occupations are characterized by multiple, short-term use of probably logistic sites which lack ceramics and architecture. The architectural remains at 41DN102 are the only ones in the project area. At best, this was a small hamlet, occupied ca. 500-650 yr bp. No evidence of horticulture was recovered, and the LPII faunas indicate a foraging strategy that emphasized deer procurement, and occasionally bison as well. Transport and curation of chert raw materials was about as frequent as in the LA, and long-distance raw material acquisition (eg. Edwards, Alibates) is not evidenced. Ceramic traditions are dominated by locally produced shell-tempered wares, which by this time were being produced in the Southern Plains region generally. As recorded by previous synthesis (Story, 1990) little if any interaction with the Caddoan area is indicated. Thus, the Ray Roberts prehistoric data suggest that regional traditions emerged at the end of the LP period largely independent of the Plains or East Texas Woodlands.

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APPENDIX A

SUMMARY OF TESTED SITES AT LAKE RAY ROBERTS

by

K. Brown

41CO35

Map Quad	Pilot Point 7.5"
Type of Remains	flakes, core
Elevation above MSL	580 feet
Vegetation	grass
Surface Visibility	5 percent
Topography	floodplain
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Site 41CO35 is located on the floodplain of Isle du Bois Creek. The site area is severely disturbed by rodent activity. The site was originally noted as an area having a thin surface scatter of lithic debris in rodent backdirt piles.

Current Research

Present research included the digging of two backhoe trenches oriented north-south. Trenches A and B were 62 and 12 meters long, respectively. No cultural materials were observed or recovered from the backhoe trenches.

Site Integrity

The site appears to have been severely disturbed by rodent burrowing. Present investigations did not delineate the presence of subsurface materials.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Site 41CO35 does not appear to have subsurface cultural materials. The site has a low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for site 41CO35.

41CO76

Map Quad	Pilot Point 7.5"
Type of Remains	flakes
Elevation above MSL	625 feet
Vegetation	grass
Surface Visibility	20 percent
Topography	terrace
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Site 41CO76 is located on a terrace of Indian Creek. A thin surface scatter of lithic debris was observed.

Current Research

Present research included digging three backhoe trenches. Trench A was oriented east-west and was dug in five sections. Section 1 was 22 meters long, section two was 3 meters long, section 3 was 2 meters long, section 4 was 3 meters long, and section 5 was 16 meters long. Trench B was oriented north-south and was 16 meters long. Trench C was oriented east-west and was 12 meters long.

Cultural materials recovered from the bachoe trenches included:
1 biface
1 large quartzite flake, interior
1 small quartzite flake, interior
2 large quartzite flakes, cortex
1 small chert flake, interior
150 grams of fire cracked rock.

Site Integrity

The site area has been minimally disturbed. Results of backhoe trenching indicate the presence of subsurface cultural materials that include a thin scatter of chipped stone artifacts and burned rock.

Adverse Impacts

Site 41CO76 will be inundated by Lake Ray Roberts.

Potential Significance

Although the site contains some subsurface cultural materials, the density of materials is very low. The cultural material is not in its primary geological context. It appears the cultural material is reworked into a Pleistocene Age terrace. The site does not appear to have potential for yielding significant information about the prehistory of the region.

Recommendation

Because of the low density of cultural materials no further work is recommended for the site.

41CO95

Map Quad	Mountain Springs 7.5"
Type of Remains	dart and arrow points, flakes
Elevation above MSL	630 feet
Vegetation	grass, trees
Surface Visibility	0 to 100 percent
Topography	terrace
Cultural Affilation	late prehistoric
Recommendations	no further work

Description

Site 41CO95 is located on a terrace of Wolf Creek. A road traverses the site area, providing 100 percent ground visibility in some areas. A dense scatter of lithic material was observed in the road.

Current Research

Present research included the digging of six backhoe trenches. Trench A was oriented north- south and was 22 meters long. Trenches B and C were oriented east-west and were 16 and 4 meters long, respectively. Trench D was oriented north-south and was 24 meters long. Trenches E and F were oriented east-west and were 8 and 2 meters long, respectively. One pottery sherd was recovered from trench A. The sherd has smoothed (floated) exterior and interior surfaces. The paste is porous with evidence of shell and/or bone temper having been leached from the matrix. No additional cultural materials were observed or recovered.

Site Integrity

The site area has been partially disturbed by historic activities that include the use of a road and construction of farm buildings.

Adverse Impacts

Site 41CO95 will be inundated by Lake Ray Roberts.

Potential Significance

Excavation of six backhoe trenches did not reveal in situ subsurface cultural deposits. It appears most of the cultural remains are confined to the plow zone. The site has low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for site 41CO95.

41CO97

Map Quad	Mountain Springs 7.5"
Type of Remains	arrow point, flakes, burned rock
Elevation above MSL	610 feet
Vegetation	grass, trees
Surface Visibility	25 percent
Topography	terrace
Cultural Affiliation	late prehistoric
Recommendations	no further work

Description

Site 41CO97 is located on a terrace of Wolf Creek. The site has a thin surface scatter of cultural material.

Current Research

Present research included the digging of two backhoe trenches and manual excavation of shovel test pits. Trench A was oriented east-west and was 20 meters long while trench B was oriented north-south and was 40 meters long. Shovel tests were dug to a depth of more than 50 cm. Cultural material recovered include:

1 large chert flake, interior
6 small quartzite flakes, interior
2 large quartzite flakes, cortex
1 small chert flake, interior
1 small quartzite flake, cortex

Most of the cultural material was recovered from a depth of less than 50 cm.

Site Integrity

The site appears to have been minimally disturbed by modern agricultural practices.

Adverse Impacts

Site 41CO97 will be inundated by Lake Ray Roberts.

Potential Significance

Although a small quantity of cultural material was recovered from the test excavations, the low density and absence of discernible features suggests the site has a low potential for yielding significant information about the prehistory of the region.

Recommendations

Because of the low density of subsurface cultural materials and the absence of a discernible cultural horizon, no further work is recommended for 41CO97.

41CO134

Map Quad	Valley View 7.5"
Type of Remains	ceramics, flakes, points
Elevation above MSL	605 feet
Vegetation	trees
Surface Visibility	10 percent
Topography	floodplain
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Site 41CO134 is located on the floodplain of Spring Creek. The site has a very thin surface scatter of lithic material.

Current Research

Present research included the digging of several 50 x 50 cm shovel tests and three backhoe trenches. Cultural materials recovered from shovel tests and backhoe trenches include:

1 Toyah-like arrow point
1 small quartzite flake, cortex
4 grams of red ochre
20 grams of mussel shell
271 grams of fire cracked rock.

Site Integrity

The site appears to have been disturbed by cultivation. Most cultural material was recovered from the uppermost 30 cm. No evidence of subsurface cultural features was noted.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Site 41CO134 has low potential for yielding significant information about the prehistory of the region.

Recommendations

Because of the shallow cultural deposit and disturbance from plowing, no further work is recommended for the site.

41CO142

Map Quad	Pilot Point 7.5"
Type of Remains	dart point, flakes
Elevation above MSL	590 feet
Vegetation	grass
Surface Visibility	5 percent
Topography	floodplain
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Site 41CO142 is located on a slight rise on the floodplain of Isle du Bois Creek. A thin surface scatter of lithic material occurs on the site.

Current Research

Current research included digging five backhoe trenches and manual excavation of a test pit to a depth of 62 cm below surface. Trenches A and B were oriented east-west and were 24 and 8 meters long, respectively. Trenches C and D were oriented east-west and were 38 and 30 meters long, respectively. Trench E was oriented north-south and was 5 meters long. Cultural material recovered from testing include:

1 Gary-like dart point, tip missing
1 stemmed dart point, blade and base missing
2 blank/preform/darts
2 blank/preform/arrows
1 biface tool
2 biface fragment
1 core
1 mano
5 large chert flakes, interior
7 small chert flakes, interior
3 large chert flakes, cortex
1 small chert flake, cortex
2 chert chunks
13 large quartzite flakes, interior
22 small quartzite flakes, interior
11 large quartzite flakes, cortex
8 small quartzite flakes, cortex
9 quartzite chunks
4250 grams of fire cracked rock

7 grams of burned earth

The broken dart point was recovered from the test pit at a depth of 42-52 cm below ground surface. A turtle carapace fragment was also recovered. One feature, feature 1, was discerned below the plow zone. The uppermost part of the feature had been truncated by the plow.

Site Integrity

The site has been disturbed by cultivation. Results of the test excavations indicate low potential for in situ buried cultural deposits that have not been disturbed by plowing.

Adverse Impacts

Site 41CO142 will be inundated by Lake Ray Roberts.

Potential Significance

The absence of intact deposits that have not been affected by cultivation suggest the site has low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for the site because of the low density of cultural material and absence of intact deposits that have not been affected by cultivation.

41DN17

Map Quad	Mountain Springs 7.5"
Type of Remains	flakes
Elevation above MSL	600 feet
Vegetation	grass, trees
Surface Visibility	5 to 100 percent
Topography	terrace
Cultural Affiliation	late prehistoric
Recommendations	no further work

Description

Site 41DN17 is located on a terrace of the Elm Fork of the Trinity River. The site area has been severely disturbed by quarrying activities and a historic residence. No surface evidence of a prehistoric occupation was observed during the present research.

Current Research

Present research included the manual excavation of

several 50 x 50 cm pits and digging two backhoe trenches. Trench A was oriented east-west and was 65 meters long. Trench B was oriented north-south and was 3 meters long. Trench A was placed in an area least disturbed by quarrying and residential use. Trench B was placed on a large earthen mound located northeast of the residence in order to determine the nature of the mound. Results indicate the earthen mound was backdirt from quarrying activities. Cultural materials recovered from testing include:
1 small chert flake, interior
1 small quartzite flake, interior
6 grams of burned earth

Site Integrity

The site has been severely disturbed by quarrying and residential activities. Testing indicates no prehistoric in situ deposits remain.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Site 41DN17 does not appear to have any prehistoric in situ deposits. The site has a low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for 41DN17.

41DN169

Map Quad	Mountain Springs 7.5"
Type of Remains	points, bifaces, metate, flakes
Elevation above MSL	590 feet
Vegetation	grass
Surface Visibility	5 to 50 percent
Topography	terrace
Cultural Affiliation	late prehistoric
Recommendations	no further work

Description

Site 41DN169 is located on a terrace of Isle du Bois Creek. A very thin surface scatter of chipped stone material was observed.

Current Research

Present research included digging three backhoe trenches. Trench A was oriented east-west and was 60 meters long. Trenches B and C were oriented north-south and were 12 and 20 meters long, respectively. A small limestone feature was observed in one trench wall. Cultural materials recovered from testing include:

2 blank/preform/darts
1 knife/point, large, wide, with concave blade, wide and shallow side notches and a convex base
2 biface fragments
1 metate
1 large chert flake, interior
1 small chert flake, interior
4 large chert flakes, cortex
4 large quartzite flakes, interior
8 small quartzite flakes, interior
7 large quartzite flakes, cortex
2 small quartzite flakes, cortex

Site Integrity

Examination of the backhoe trenches indicate the site has been severely disturbed by rodent burrowing and vegetation (e.g., roots). Although one small limestone feature was observed in one trench wall, it is unlikely that the site contains large quantities of in situ cultural remains.

Adverse Impacts

Site 41DN169 will be inundated at Lake Ray Roberts.

Potential Significance

Results of the backhoe trenching indicate the low potential for in situ cultural deposits because of severe disturbance by rodent burrowing and vegetation.

Recommendations

No further work is recommended for site 41DN169.

41DN173

Map Quad	Mountain Springs 7.5"
Type of Remains	point, flakes
Elevation above MSL	580 feet
Vegetation	grass
Surface Visibility	5 to 20 percent
Topography	terrace
Cultural Affiliation	late prehistoric
Recommendations	no further work

Description

Site 41DN173 is located on a terrace of Isle du Bois Creek. The site area is severely disturbed by rodent burrowing and quarrying activities. The site was originally noted as an area having a thin surface scatter of lithic debris.

Current Research

Present research included digging two backhoe trenches. Trenches A and B were oriented north-south. Trench A was 3 meters long and trench B was greater than 6 meters long. No cultural material or deposits were observed on the surface or in the backhoe trenches.

Site Integrity

The site appears to have been severely disturbed by rodent burrowing and slope erosion. Present investigations did not delineate the presence of subsurface materials.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Site 41DN173 does not appear to have subsurface cultural materials. The site has low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for 41DN173.

41DN347

Map Quad	Mountain Springs 7.5"
Type of Remains	burned rock, mussel shell (when originally reported)
Elevation above MSL	580 feet
Vegetation	grass, trees
Surface Visibility	5 percent
Topography	terrace
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Site 41DN347 is located on a terrace of the Elm Fork of the Trinity River near its confluence with Pond Creek. A thin surface scatter of burned rock and mussel shell were observed when the site was originally recorded.

Current Research

Present research included digging several backhoe trenches across the terrace. No cultural material or subsurface deposits were observed.

Site Integrity

The site probably consists of a very thin scatter of cultural material. The site area has been cultivated in the past.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Site 41DN347 appears to have a low potential for yielding significant information about the prehistory of the region. This is based on negative results of backhoe trenching and examination of the ground surface.

Recommendations

No further work is recommended for site 41DN347.

41GS67 and 41GS68

Map Quad	Pilot Point 7.5"
Type of Remains	flakes

Elevation above MSL	630-640 feet
Vegetation	grass, trees, cultivated field
Surface Visibility	10 percent
Topography	upland slope
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

Sites 41GS67 and 41GS68 were originally recorded as separate sites but they appear to be connected by a relatively continuous scatter of lithic debris on the surface. The sites are located on an upland slope that has been subjected to severe erosion due to cultivation and grazing.

Current Research

Present research included the digging of four backhoe trenches (trench A on 41GS68 and trenches B-D on 41GS67) and manual excavation of a 50 x 50 cm test pit at 41GS67. All of the trenches were oriented north-south, perpendicular to the valley. Trenches A and D were 16 meters long and trenches B and C were each 3 meters long.

Cultural materials recovered from the test pit include:

1 large chert flake, interior
6 small chert flakes, interior
1 small chert flake, cortex
1 chert chunk
1 large quartzite flake, interior
6 small quartzite flakes, interior
1 small quartzite flake, cortex

Site Integrity

The test pit was dug to a depth of 110 cm. Small quantities of cultural material (i.e., flakes) were recovered from throughout the entire depth of the pit. The deposits appear to be colluvium, redeposited from upland erosion. The prehistoric cultural deposits do not appear to be in their primary geologic contexts.

Adverse Impacts

The sites will be subjected to shoreline erosion from Lake Ray Roberts.

Potential Significance

Sites 41GS67 and 41GS68 have a low potential for yielding significant information about the prehistory of the region due to the nature of the deposits. The deposits containing the cultural remains appear to be colluvial and recent in origin.

Recommendations

No further work is recommended for sites 41GS67 and 41GS68.

RRRN5

Map Quad	Mountain Springs 7.5"
Type of Remains	point/preform, biface, core, flakes
Elevation above MSL	590-610 feet
Vegetation	grass, a few trees
Surface Visibility	40-60 percent
Topography	terrace
Cultural Affiliation	prehistoric, unknown
Recommendations	no further work

Description

The site is located approximately 0.7 mile west of the junction of Highways 455 and 372, and is approximately 0.7 mile north of Highway 455. It is on top of a terrace overlooking the confluence of the Sand Branch and Isle du Bois Creek. The site is relatively flat, but slopes steeply outside the site limits. The site has been disturbed by the clearing contractors and by the construction of a stock pond at its north end.

Current Research

RRRN5 was not previously recorded. An intensive surface collection and systematic shovel testing was conducted over the entire site area. Results of shovel tests indicate extensive erosion of the surface with no evidence of buried in situ cultural deposits. Cultural materials recovered include:

2 preform/darts
1 biface fragment
1 core
1 large chert flake, interior
5 small chert flakes, interior
1 large chert flake, cortex
1 chert chunk
3 large quartzite flakes, interior
6 small quartzite flakes, interior
19 large quartzite flakes, cortex
6 small quartzite flakes, cortex
372 grams of fire cracked rock

Site Integrity

The site has been subjected to severe surface erosion and construction of a stock pond. Results of shovel tests indicate low potential for subsurface cultural deposits.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

Results of shovel testing indicate a low potential for yielding significant information about the prehistory of the region.

Recommendations

No further work is recommended for the site.

RRRN6

Map Quad	Mountain Springs 7.5"
Type of Remains	points, flakes
Elevation above MSL	620-640 feet
Vegetation	grass
Surface Visibility	20-30 percent
Topography	ridge
Cultural Affiliation	middle to late archaic
Recommendations	no further work

Description

The site is near the top of a ridge that has been severely eroded. The site overlooks Pond Creek and is approximately one mile from the Elm Fork of the Trinity River. The top of the ridge is narrow but relatively flat. A surface scatter of lithic artifacts was observed on the eroded slopes of the ridge.

Current Research

RRRN6 was not previously recorded. Present research included a surface grab collection and a systematic shovel testing of the site area. Results of the shovel tests indicate the site has been severely eroded with no subsurface cultural deposits present. Cultural materials recovered include:

1 Morrill-like dart point
1 point, with exanding stem dart point
2 bifaces
1 biface tip
1 uniface
8 chert flakes, interior
7 chert flakes, cortex
3 quartzite flakes, cortex
1 hematite

Site Integrity

The site has been subjected to severe surface erosion. Results of shovel testing indicate no subsurface cultural deposits are present.

Adverse Impacts

The site will be inundated by Lake Ray Roberts.

Potential Significance

The site has a low potential for yielding significant information about the prehistory of the region due to its being severely eroded and absence of subsurface cultural deposits.

Recommendations

No further work is recommended for the site.

APPENDIX B

HUMAN SKELETAL MATERIALS FROM ISLE DU BOIS CREEK

by

HARRELL GILL-KING

Human Skeletal Materials from Isle du Bois Creek

(41DN102, 41DN99, and 41DN197)

Introduction - Here we describe the skeletal remains of three adults and two children excavated from Archaic and Late Prehistoric sediments in the Isle du Bois Creek environs. Sufficient materials are present for establishing the longevity of all individuals, and, in the case of the adults, attribution of sex as well. Nutritional evaluation by standard morphological means and by stable isotope analysis is provided for comparative purposes. Notes on individual pathological features are also given.

Skeletal and dental inventories for each individual are located in appendices to simplify discussion.

41DN102 - The site is located on a terrace of Isle du Bois Creek whose sediments and associations are of the Late Archaic and Late Prehistoric type with radiocarbon dates in the range of 900 to 2200 BP. All of the skeletal materials are badly damaged having been leached and subjected to humic acids. Water has been the principal diagenetic variable.

Feature 1/ Burial 1 - These are the remains of an adult female buried in a prepared pit in tightly-flexed position and deposed on the left side. The crown-rump axis is due GN with the face directed eastward. The grave dimensions were 70 x 46 cm by 30 cm deep. A large area of organic stain was present in the pit beneath the remains. There was no evidence of binding upon any of the elements present, although the degree of flexion suggests that binding may have been used. Leg bones were essentially parallel to the spine.

Sex and Parity/ The sex was diagnosed as female based upon: (1) small mastoid processes, (2) insertion of the zygomatic arch anterior to the auditory meatus, (3) sharp superior orbital margins, (4) single, rounded mental eminence, (5) broad, shallow scatic notch, and (6) a femoral head diameter of 36.6 mm.

A deep, roughened preauricular sulcus, (Plate 1) together with considerable lipping of the sacroiliac joints imply at least one pregnancy, (Krogman and Iscan 1986:259).

Skeletal and Dental Age at Death / Several cranial and postcranial indicators of age are noted. Although epiphyses are completely sealed, recent fusion lines are present on proximal humerus, radius, and femoral head. Not all of the vault sutures are present in their entirety, but all segments of the coronal, sagittal, and lambdoid, (the most complete suture), conserved give a score of about 1.8. (Meindl and Lovejoy 1985:62)

Rib and pubic symphyseal phase analyses are not possible due to the incompleteness of the specimen. We would assign these remains to early third decade, perhaps 20-25 years, on the skeletal evidence if this were a modern individual. The subject appears dentally young on the basis of the low degree of wear and the absence of abscesses and peridontoclasia.

Stature and Physique / Stature, based upon the fragmentary method of Steele, (1970:91), using segments 1, 2, and 3 from the right femur, is approximately 143-151 cm. A biepicondylar width of 51 mm at this stature indicates a small frame. Well-developed radial tubercles, a prominent right linea aspera, and sharp interosseous crests indicate that musculature was generally well-developed at some point in life.

Skeletal and Dental Pathology / As noted above, there is little evidence of infection in the mouth. In the maxilla numbers, 1, 2, 15, and 16 are absent and the alveoli well-resorbed. Number 8 and 9 are shovelled as one would expect with about 20% of the crowns worn away in an edge-to-edge occlusal pattern. Number 17 is absent and resorbed and number 32 is peg-shaped. The lateral root of number 30 penetrates the alveolus buccally, but there is no evidence of reactive bone.

The fragmentary cranial and postcranial skeletal remains show no evidence of traumatic or infectious disease. Long bone cortices are of normal thickness and flat bones exhibit ratios of cancellous and compact tissue appropriate to a female of the age determined. It is interesting that gestation apparently did little to compromise mineral metabolism in this young female, (an observation worth recalling in light of dietary findings-see below).

Feature 10 / Burial 2 - These are the poorly-preserved remains of an adult human located within a presumed burial pit which is badly defined. The bone fragments are situated within an area measuring 50 x 30 cm and approximately 14-16 cm in depth. The cranium is situated on the left side and appears oriented eastward, however, the crown-rump axis is not discernable. This finding and the spatial distribution of the human materials suggest a flexed burial.

Sex / The sex is unequivocally male based upon robusticity criteria: (1) the nuchal area is prominent and roughened, (2) the linea aspera is wide, (9 mm) and raised, (3) superior orbital margins are straight and blunt, (4) large deltoid tuberosites are present on the humeri, and (5) the mandible is robust with double mental eminences and a prominent mylohyoid ridge.

Skeletal and Dental Age at Death / Although pubic and rib phase analyses are precluded, a number of senescent features indicate an age beyond middle years. Cross-sectional remodeling of femoral and tibial shafts, (i.e. bone drift), is marked. The loss of trabecular bone extends to a point above the greater trochanter in the femora, a feature indicative of fifth or sixth decade in modern populations, (Krogman and Iscan, Ibid: 177). Sutures in the vault group are difficult to detect endocranially and vascular markings, (middle meningeal and branches), and pacchionian crypts are numerous and pronounced. Cortical thinning and disappearance of the diploe are noted over portions of the right parietal and occipital. The overall impression is that of a skeletally old adult. This is corroborated by extreme dental attrition. Numbers 17, 20, 21, 28, 31, and 32 are worn to the point of exposing the pulp chamber. Numbers 18, 19, and 29 are absent premortem and exhibit resorption of.

Stature and Physique / Long bone elements are too fragmentary for meaningful reconstruction of stature. The femora are stenomeric, but epiphyses are too badly damaged for bicondylar measurement. As noted above, (sex criteria), the insertions present display remodelling consistent with well-developed musculature.

Skeletal Pathology / Plate 2 shows a healed hematoma on the basilar aspect of the occipital, (Aegerter and Kirkpatrick 1968:263). There is no other evidence of infectious or traumatic pathology in these scant remains. Thinned cortices and trabecular changes should be interpreted as a part of normal senescence rather than metabolic or nutritional disturbance. As noted above, the oral disease picture is appropriate for an adult of advanced age.

Feature 12 / Burial 3 - These are the remains of a child interred in a prepared pit extending from level 5 to level 7. The pit is 63 x 44 cm in diameter with a depth of approximately 11 cm. The remains are tightly flexed and deposed upon the left side, (as in features 1 and 10). Crown-rump axis is due GN with the face oriented eastward.

Sex / Remnants of the innominate bones are too fragmentary for statistical or radiological analysis. Attempts at sexing would yield results no better than chance.

Skeletal and Dental Age at Death / The two mandibular first molars are erupted and occluded with slight wear already present. The enamel of the deciduous incisors is worn away occlusally. Three crowns of permanent canines are visible in the alveolus but unerupted. Radiographically no canine roots are present although slight mineralization is noted. Crowns of twelve year molars are not yet complete within the alveoli. The child appears to be between six and seven years of age by modern standards of dental development, (Cottone and Standish 1982:166). The basilar synchondrosis is open and seven fragmented neural arches unattached to centra are present. Sutures visible on the numerous fragments of neurocranium are also consistent with the dental age given.

Development / Although the remains are highly fragmentary and incomplete, all cortices and diploe of cranial bones, and spongiosa of ilia and sternum signify normal development. No cribriforming of the cranial tables can be found under the hand lens and fragments of diaphyses of ulnae, radii, femora, and tibiae are normal in cross section. There are no enamel lines noted in the anterior teeth nor growth arrest lines evident on x-ray of the tibial fragments.

Skeletal and Dental Pathology / It is possible that at this early age the subject has not yet been affected by the cycles of annual protein deprivation seen elsewhere, (see nutritional analysis below). There is no evidence in these scant remains of infection or trauma that might suggest a cause of death at such an early age.

41DN99 - This site is located on the floodplain of Isle du Bois Creek. Radiocarbon dates on charcoal samples from levels 10 and 11, (which are associated with Feature 11), indicate 1530+/-80 BP. The single burial is assigned to Late Archaic.

Feature 11 / Burial 3 - This burial extends from level 9 to level 12 and consists of a prepared oval pit 63 x 94 cm in diameter and approximately 45 cm deep. An adult skeleton was deposed in flexed position. Unlike the 41DN102 burial pits, this one was lined with slanting stone slabs. Several flat slabs were discerned on the floor beneath the burial. There were no rocks above the burial nor were any grave goods noted.

Sex / The sex is male based upon: (1) a deep suprascapular notch on the right scapula, (Bass 1987:119), (2) a biepicondylar width of 64 mm, (rt. humerus), (3) a large and roughened linea aspera on the left femoral midshaft. The insertion of the temporalis muscle is marked.

Skeletal and Dental Age at Death / All long bone epiphyses are completely fused and the cross-sectional femoral fragments indicate some degree of remodelling. Outer and inner tables of the parietal and occipital fragments and the diploe are in proper proportion for a young to middle-aged adult, and vascular markings are not pronounced. Segments are the masto-occipital suture are still serrate and only partially fused. This suture completes fusion at about fifty years in modern populations (McKern and Stewart 1957:39). Dental eruption is complete with several elements missing and completely resorbed, (e.g. Numbers 24, 25, 26, and 28).

Mandibular elements show third and fourth degree attrition. No senescent phenomena are noted on any of the fragments, thus, the overall pattern is that of a young to middle-aged male.

Stature and Physique / In situ measurement of the right humerus, (325 mm), allowed calculation of stature. The estimated stature of 165-173 cm with a biepicondylar width of 64 mm signifies a medium to robust frame, (Genoves 1967:71). This is supported by large, roughened insertions at the lineae asperae, right radial and deltoid tubercles, and a fragment of the right anterior iliac crest near the rectus origin. This skeletally robust male possessed well-developed musculature.

Skeletal and Dental Pathology / Dental pathology is minimal. There is generalized incipient periodontoclasia and only a moderate amount of calculus. Numbers 24, 25, 26 and part of the socket of 28 are resorbed. Here the alveolus is well-filled so that the losses appear to have been of long standing. The occlusal wear exposes the pulp chambers of #19-22 and #30, however the pulp chambers of the distal two molars are less worn. This pattern probably reflects some ancillary use of the more anterior teeth rather than diet.

Burial three exhibits the greatest amount of skeletal pathology in this series. External porotic hyperostosis, (Ortner and Putschar 1985:258-59, 273), is present on the left parietal fragment near the midline. Of greatest interest is a complex of apparently functionally related features involving the left scapula, humerus, radius, and ulna. The generalized periostitis worsens distally, (see Plate 3). Prominent exostoses are seen on the medial epicondyle of the left humerus, (Plate 4) just above the olecranon foramen. The periostitis is most severe on the radius; there is volar flattening distally and a deep abscess, (15 x 5 x 7 mm) at the tubercle, (Plate 5), Note the blunted interosseous crest, (Plate 3). Whether this flattening was cause or effect, there was little pronation or supination possible in the arm. The ulna displays complementary blunting of the crest and there is marked periostitis with abscesses on the inferior side of the coronoid, (15 x 5 x 3 mm) and olecranon, (Plate 6).

Both right and left femora exhibit active and remodeled periostitis, (Plate 3). The right tibia has a "melted wax" excrescence at the anterior margin of the plateau. The corresponding fibula and cuboid display only mild, inactive periostitis with remodeling, (Plate 7).

There is reactive remodelled bone in and around the rhomboid facet of the manubrium and associated periostitis on the costochondral margins of several ribs, (Plate 8). The latter may have been associated with excessive tension or sclerosing of the serratus muscles.

Flexion, extension, and pronation/supination of the left arm were limited and probably very painful, (Stone and Stone 1990:23, 116-124). Modified movement likely produced accentuated wear on lunate and hamate. An alternate muscular pattern may have underlain the unusual wear on the suprascapular ridge, coracoid, manubrium, and ribs.

All of the changes noted are of long-standing, (two years or more). The most likely aetiology is traumatic introduction of a collagenase-producing organism, (e.g. The common skin flora Staphylococcus aureus is causative in 90% of cases). Once introduced, hematogenous spread would have produced the effects noted without immediate mortality, (Ortner and Putschar, Ibid: 106; Aegerter and Kirkpatrick, Ibid: 761-62).

41DN197 - The site is located on the terrace of an abandoned channel of Isle du Bois Creek about two kilometers from its confluence with the Elm Fork of the Trinity River. Radiocarbon samples from flecks of charcoal indicate a range of 1260-1120 BP. Associations are appropriate to Late Prehistoric 1.

Feature 2 / Burial 1 - This feature consists of a semi-flexed burial of a small child within a prepared oval-shaped pit. The dimensions of the pit are 25 x 45 cm. The burial originates at a depth of approximately 73 cm. below the surface in level 9 and continues through level 10. The burial was removed as a single block to facilitate analysis. The remains are in fragmentary condition and poorly preserved.

Sex / The poor condition of the remains and early developmental status preclude diagnosis of sex.

Skeletal and Dental Age at Death / Fifteen fused laminae are noted together with six detached centra. Right and left halves of the laminar arch fuse by three years, and centra fuse to the laminae by seven. A 5.3 cm fragment of the left mandibular ramus bears a fully occluded six year molar. The crown of the twelve year molar is formed but not yet above what would probably be the gum line. The two upper central incisors which are about to erupt have roots that are approximately 75% complete. Age is estimated to be about seven years assuming developmental rates equivalent to those of modern populations.

Development / Cortices and shaft diameters seem age-appropriate. One well-formed sphenoid fragment and several basilar fragments of cranium are of normal thickness. Damage, (the skull presents in 161 fragments), precludes a basion to porion height determination, however there are no Harris lines on x-rays of tibial shaft fragments and no enamel lines noted on the anterior dentition. Comparison of diploe and cortices in rib and skull fragments and in the two small ilial fragments suggest normal hemopoetic elements.

Skeletal and Dental Pathology / Among the fragmentary remains there is no evidence of infection, although a rapidly fatal bout would not be expected to leave evidence in the hard tissues. Remains are too scant and ill-preserved for evaluation for metabolic, congenital, or traumatic disease. Starvation cannot be ruled out because the stable isotope analyses, (see encl), represent only an overall cumulative picture of nutrition and would not have been affected by a sudden and acute deficiency of calories. Death by starvation is an ever present spectre for those who must live with the exigencies of hunting, foraging, and collecting. We draw no conclusions in the matter of cause of death at such an early age.

Human Diet -

Table 1 gives the stable isotope ratio values in mils for the adults and children of known provenience for the 41DN102, 99, and 197 series. It should be noted that these individuals do not constitute a population in a cultural sense.

The nature of the sample notwithstanding it appears that there is no favoring or either sex among adults with respect to meat calories as has been reported elsewhere, (Krueger 1985:16). Table 2, (after Krueger and Sullivan 1984:219), indicates that the overall distribution of results accords with that of other archaeologically known hunter-gatherer populations.

Individuals 3 and 5 are seen to be the "most carnivorous" in the sample. These, however, are young children which raises the possibility of calorie shunting by age. Parsons, (1941:32), ethnographically notes this practice among the Caddo, but Newcomb, (1961:300), citing similar groups, points to the fact of late weaning stating that a 'child might be nursed until another sibling was born'.

Because it is impossible to know the sex or exact age of either of the children in the sample, these possible interpretations should be approached with caution since the isotopic picture is a cumulative one which represents average diet over several years. Our conservative appraisal is that each case represents a kind of 'residual carnivory' due to the important role of colostrum in the diet which has not been erased by a more mixed adult diet.

It is important to note that neither child shows any osetological or dental evidence or protein calorie deprivation, (see pathology sections above).

Skeletal and Dental Appendices

Tables

Photographs

Bibliography

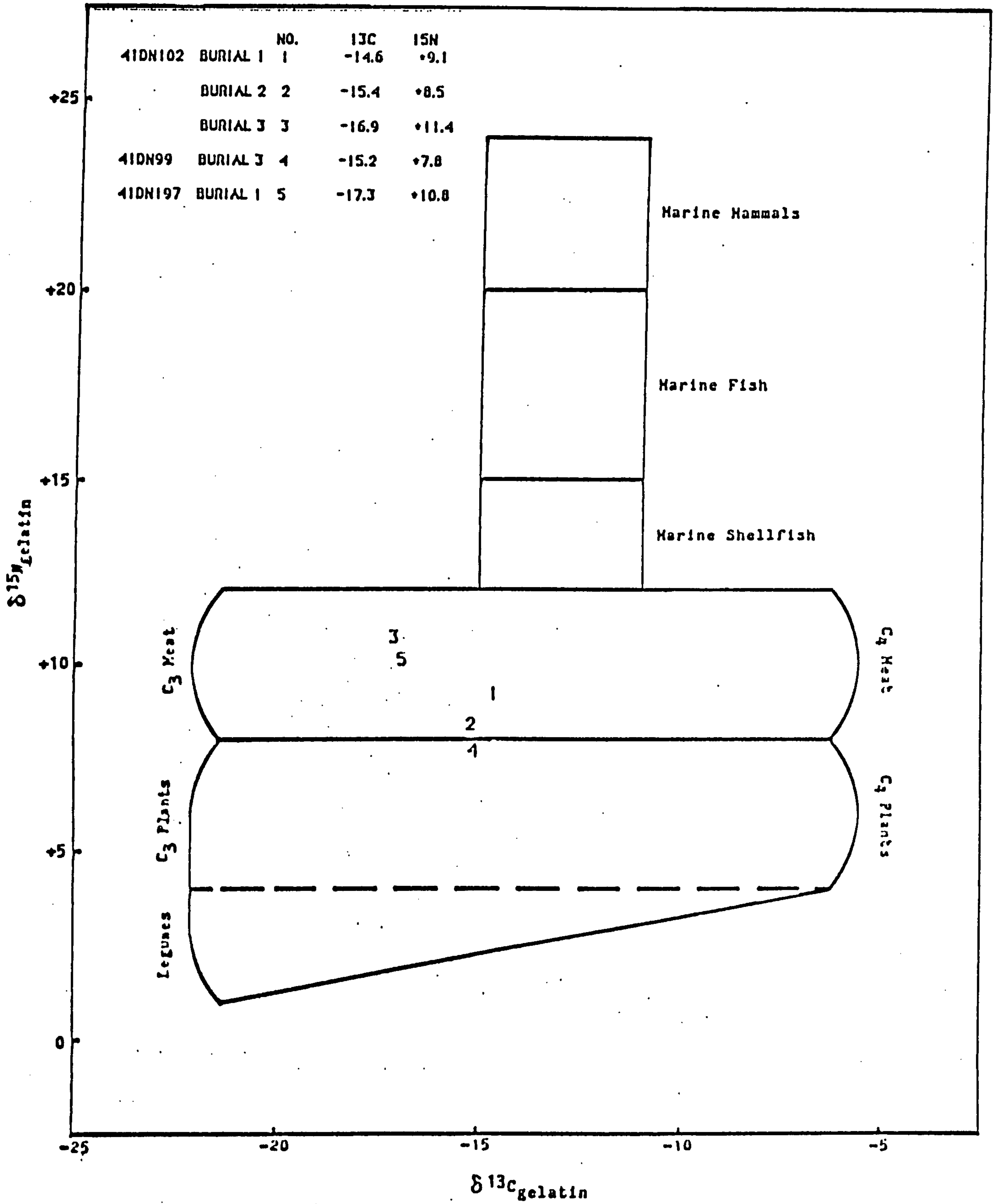
Table 1

^{13}C Gelatin and ^{15}N* vs. Age and Sex

Site/Feature/Burial	Age	Sex	13C	15N	Interpretation
41DN102					
Fea 1/Bur 1	adult	F	-14.6	+9.1	C3meat/C3 plants
Fea 10/Bur 2	adult	M	-15.4	+8.5	C3meat/C3 plants
Fea 12/Bur 3	child	?	-16.9	+11.4	C3meat(colostrum)
41DN99					
Fea 11/Bur3	adult	M	-15.2	+7.8	C3meat/C3 plants
41DN197					
Fea 2/Bur 1	child	?	-17.3	+10.8	C3meat(colostrum)

* per mil notation

Table 2



NO. 13C 15N
41DN102 BURIAL 1 1 -14.6 +9.1
BURIAL 2 2 -15.4 +8.5
BURIAL 3 3 -16.9 +11.4
41DN99 BURIAL 3 4 -15.2 +7.8
41DN197 BURIAL 1 5 -17.3 +10.8
Marine Mammals
Marine Fish
Marine Shellfish
C3 Meat
C4 Meat
C3 Plants
C4 Plants
Legumes
δ15N gelatin
δ13C gelatin
+25
+20
+15
+10
+5
0
-25
-20
-15
-10
-5

DENTAL INVENTORY

SITE		41DN102			41DN99	41DN197
BURIAL		1	2	3	3	1
NUMBER						
(Maxillary)						
1		R		X	A	
2		R		E	A	E
3		A		O	+2	O
4	A*	A		+1*	+2	
5	B	P		+1*	A	
6	C	P			+2	
7	D	+3		+1*	A	
8	E	+3		+1*	+3	E
9	F	+3		+1*	+2	E
10	G	+3		+1*	+2	
11	H	+3		X	+2	
12	I	+3		+1*	+2	
13	J	A			+2	
14		A			+2	O
15		R		O	P	X
16		R			R	
(Mandibular)						
17		R	+3	X	+3	
18		A	R	E	+3	
19		A	R	O	P	
20	K	A	P		P	
21	L	A	P		P	
22	M	A	+3		P	
23	N	A	A	+1*	P	
24	O	A	A	+1*	R	+1*
25	P	A	A	+1*	R	+1*
26	Q	+3	A	+1*	R	
27	R	+3	A		A	
28	S	+3	P		R	
29	T	+2	R		+3	+1*
30		+2	+1		P	
31		+1	P		+3	
32		+1	P		+3	

A = absent postmortem; R = resorbed; P = pulp exposed; F = fractured; O = occluded; E = emergent crown; X = within alveolus; I = abscess; +1 = mild attrition; +2 = moderate attrition; +3 = severe attrition; * = deciduous

SKELETAL INVENTORY

SITE/Feature 41DN99 FEA 11
BURIAL B-3

Mass (gm) 1164

POST-CRANIAL MATERIAL:

Code: DM = Distal Medial; D = Distal; M = Medial; PM = Proximal Medial; P = Proximal; W = Whole; WE = Whole with articular surfaces eroded; F = Fragmentary .

LIST NUMBER OF EACH:

	R							L							Side Uncertain						
	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE
Humerus	•												•								
Ulna											•										
Radius											•										
Femur											•										
Fibula												•					•				
Tibia			•								•										
Clavicle																					

LIST NUMBER OF EACH:

	R		L	
	W	F	W	F
Innominate				•
Patella				
Scapula		•		•
Calcaneus				
Talus				

LIST NUMBER OF EACH:

	W	F		W	F
Carpals	2		Ribs		11
Tarsals		1	Sternum		•
Metacarpals			Cervical Verts.		1
Metatarsals			Thoracic Verts.		
Phalanges		2	Lumbar Verts.		
UNIDENTIFIABLE FRAGS.			Sacrum		

CRANIAL MATERIAL*	F (#)	W (R/L)
Frontal		
Parietal	2	
Occipital	1	
Temporal		
Sphenoid		
Maxilla		
Zygoma		
Mandible	1	
Palate		

*Ossicles, hyoid, lacrimal, vomer, ethmoid, nasal and conchae are omitted.

SKELETAL INVENTORY

SITE/Feature 41DN102 FEA 12
BURIAL B-3

Mass (gm) 418

POST-CRANIAL MATERIAL:

Code: DM = Distal Medial; D = Distal; M = Medial; PM = Proximal Medial; P = Proximal; W = Whole; WE = Whole with articular surfaces eroded; F = Fragmentary .

LIST NUMBER OF EACH:

	R							L							Side Uncertain						
	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE
Humerus																		•			
Ulna			F														F				
Radius																		•			
Femur			F																		
Fibula																	•				
Tibia																	•				
Clavicle																					

LIST NUMBER OF EACH:

	R		L	
	W	F	W	F
Innominate		4		2
Patella				
Scapula				
Calcaneus				
Talus				

LIST NUMBER OF EACH:

	W	F		W	F
Carpals			Ribs		26
Tarsals			Sternum		
Metacarpals			Cervical Verts.	1	
Metatarsals			Thoracic Verts.	5	
Phalanges		16	Lumbar Verts.	2	
UNIDENTIFIABLE FRAGS.			Sacrum		

CRANIAL MATERIAL*	F (#)	W (R/L)
Frontal	6	—
Parietal	8	—
Occipital	6	—
Temporal	2	—
Sphenoid	1	—
Maxilla	2	—
Zygoma	3	—
Mandible	4	—
Palate	1	—

*Ossicles, hyoid, lacrimal, vomer, ethmoid, nasal and conchae are omitted.

SKELETAL INVENTORY

SITE/Feature 41DN102 FEA 10
BURIAL B-2

Mass (gm) 960

POST-CRANIAL MATERIAL:

Code: DM = Distal Medial; D = Distal; M = Medial; PM = Proximal Medial; P = Proximal; W = Whole; WE = Whole with articular surfaces eroded; F = Fragmentary .

LIST NUMBER OF EACH:

	R							L							Side Uncertain						
	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE
Humerus			•	•						F				•							
Ulna																					
Radius																					
Femur			•							•											
Fibula			•						•												
Tibia			F							•											
Clavicle																					

LIST NUMBER OF EACH:

	R W	R F	L W	L F
Innominate				
Patella				
Scapula				
Calcaneus				
Talus				

LIST NUMBER OF EACH:

	W	F		W	F
Carpals			Ribs		
Tarsals			Sternum		
Metacarpals			Cervical Verts.		
Metatarsals			Thoracic Verts.		
Phalanges	1		Lumbar Verts.		
UNIDENTIFIABLE FRAGS.			Sacrum		

CRANIAL MATERIAL*	F (#)	W (R/L)
Frontal	4	
Parietal	6	
Occipital	7	
Temporal	1	
Sphenoid		
Maxilla	1	
Zygoma	1	
Mandible	2	
Palate		

*Ossicles, hyoid, lacrimal, vomer, ethmoid, nasal and conchae are omitted.

SKELETAL INVENTORY

SITE/Feature 41DN102 FEA 1
BURIAL B-1

Mass (gm) 1860

POST-CRANIAL MATERIAL:

Code: DM = Distal Medial; D = Distal; M = Medial; PM = Proximal Medial; P = Proximal; W = Whole; WE = Whole with articular surfaces eroded; F = Fragmentary .

LIST NUMBER OF EACH:

	R							L							Side Uncertain						
	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE
Humerus				•						•											
Ulna					•						•										
Radius				•							•										
Femur				•								•				•	•				
Fibula																					
Tibia			•								•										
Clavicle	•								•												

LIST NUMBER OF EACH:

	R		L	
	W	F	W	F
Innominate		•		•
Patella				
Scapula		•		•
Calcaneus				
Talus				

LIST NUMBER OF EACH:

	W	F		W	F
Carpals		2	Ribs		12
Tarsals		5	Sternum		
Metacarpals			Cervical Verts.		2
Metatarsals			Thoracic Verts.		6
Phalanges		5	Lumbar Verts.		2
UNIDENTIFIABLE FRAGS.	19		Sacrum		•

CRANIAL MATERIAL*	F (#)	W (R/L)
Frontal	5	—
Parietal	11	—
Occipital	5	—
Temporal	7	—
Sphenoid	1	—
Maxilla	6	—
Zygoma	2	—
Mandible	2	—
Palate	1	—

*Ossicles, hyoid, lacrimal, vomer, ethmoid, nasal and conchae are omitted.

SKELETAL INVENTORY

SITE/Feature 41DN197 FEA 2
BURIAL B-1

Mass (gm) 940

POST-CRANIAL MATERIAL:

Code: DM = Distal Medial; D = Distal; M = Medial; PM = Proximal Medial; P = Proximal; W = Whole; WE = Whole with articular surfaces eroded; F = Fragmentary.

LIST NUMBER OF EACH:

	R							L							Side Uncertain						
	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE	DM	D	M	PM	P	W	WE
Humerus																					
Ulna				•																	
Radius				•						•											
Femur			•							•											
Fibula			•							•											
Tibia			•							•											
Clavicle																					

LIST NUMBER OF EACH:

	R		L	
	W	F	W	F
Innominate		•		•
Patella				
Scapula				
Calcaneus				
Talus				

LIST NUMBER OF EACH:

	W	F		W	F
Carpals			Ribs		66
Tarsals			Sternum		
Metacarpals			Cervical Verts.		1
Metatarsals			Thoracic Verts.		4
Phalanges			Lumbar Verts.		1
UNIDENTIFIABLE FRAGS.			Sacrum		

CRANIAL MATERIAL*	F (#)	W (R/L)
Frontal	5	
Parietal	17	
Occipital	11	
Temporal	15	
Sphenoid	1	
Maxilla	9	
Zygoma	1	
Mandible	5	
Palate	1	

*Ossicles, hyoid, lacrimal, vomer, ethmoid, nasal and conchae are omitted.

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